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Getting the Most from Molding Machines

What 100 Per Cent Efficiency Means—The Machine in the Jobbing Shop—How Several Different Classes of Work Were Successfully Molded on a Jarring Machine

BY P. R. RAMP*

One hundred per cent efficiency of the molding machine can be interpreted several different ways: The number of molds produced per day, the percentage of saving, or the total hours the machine is operated daily.

The number of hours the machine is operated coupled with the quantity and quality of the work produced is what should determine the percentage of efficiency. The efficiency of the machine in the foundry is controlled largely by the amount of thought and study devoted to it. When we expect to receive a fair day's work from a molder we provide for him the best equipment his work can pay for. If we expect the machine to give us the best it has to give, we must treat it in the same manner. Unlike man the machine, if properly oiled and cared for, can work continuously for ten or twenty-four hours a day and one day's work will be a duplicate of the others.

There are very few castings that can not be produced by the use of a molding machine cheaper than by hand molding. And when a foundryman realizes these facts, he should not hesitate to invest in suitable equipment for it. For the benefit of those interested, we contribute the following description of how several different classes of work were successfully molded on a jarring machine, and how some of the flasks and other equipment should be constructed to get the best results.

THE MACHINE IN THE JOBBING SHOP

The machine in the jobbing shop appears to be one of the problems that confront us to-day. Will it pay? How can we make our flasks and equipment cover the great area consisting of so many different kinds of work?

In taking care of a jobbing business the best practice is to make two or three standard sized flasks, have each size interchangeable and have them large enough to mold several pieces at one time or one large piece.

Fig. 1 is a drawing of a machine flask 52 in. x

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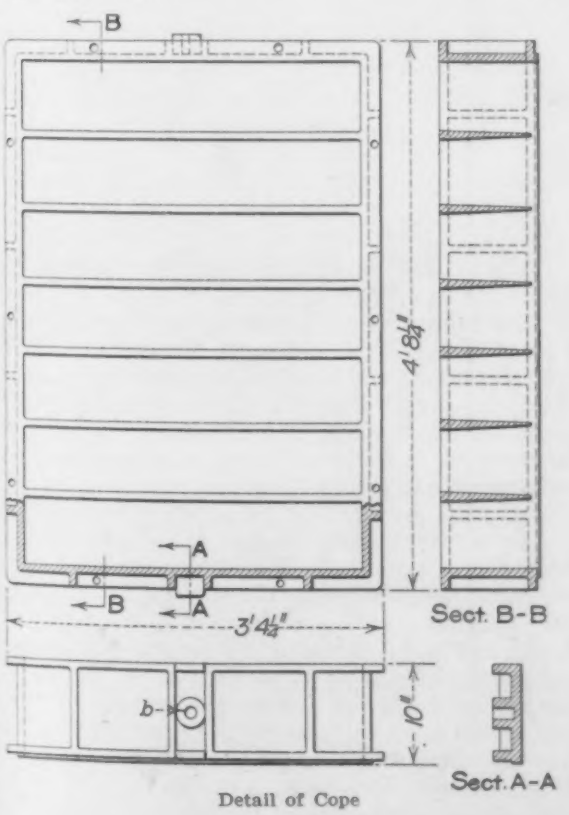
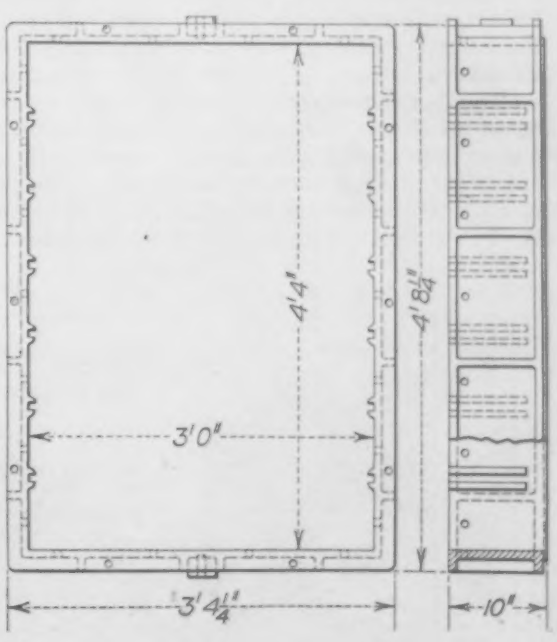


Detail of Cope



Detail of Drag

Fig. 1—A Drawing of a Machine Flask Made to Cover a Large Number of Jobs

36 in. x 10 in. deep. This flask is made to cover a large number of jobs and is constructed so a very deep mold can be made by placing one flask upon the other until the required depth is obtained. The

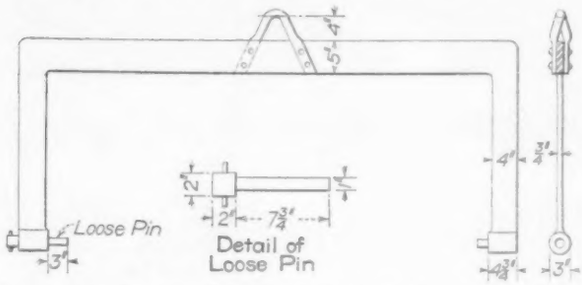


Fig. 2—The Bail for Lifting the Flask Shown in Fig. 1, with the Detail of the Loose Pin

small holes on both flanges are provided for the bolts to hold the pieces together when a deep flask is required. The drag part of the flask is provided with internal flanges that form grooves that will take care of special bars in cases where castings are molded that project into the cope to some extent. This plan reduces the necessity of cutting or breaking out any of the bars in the copes.

In making copes for the jarring machine the bars should be constructed as shown in Fig. 1, which consists of a bar from 1 in. thick tapering down to ¼ in. thickness. This gradual taper insures a solid surface on the cope part of the mold, free from soft spots that usually develop under the bars when the taper of the same is too short. In jarring sand in a cope it has a tendency to jar away from the under side of any bars or lugs, and the tapered bar, as illustrated here, overcomes this trouble. All flasks are made with the pin holes drilled so they will be interchangeable. The trunnion which usually takes up so much room and adds to the weight of the flask is replaced by the hollow lug shown at *b*.

Fig. 2 is the bail used for lifting these flasks. Being rigid it is possible for one man to hook up a flask alone, and by an arrangement of one long pin and one short one he can close his molds alone. This item is worth considerable when you are figuring out every move necessary to secure 100 per cent efficiency.

Fig. 3 is the standard pattern board we recommend for the molding machine. This board is made almost indestructible by the reinforced ends, which are made of good iron and machined to the proper size. This iron end acts as pin plate and supports the heavy flasks that are placed on the board, thus preventing them from jarring down into the surface of the board and producing a low joint in the mold.

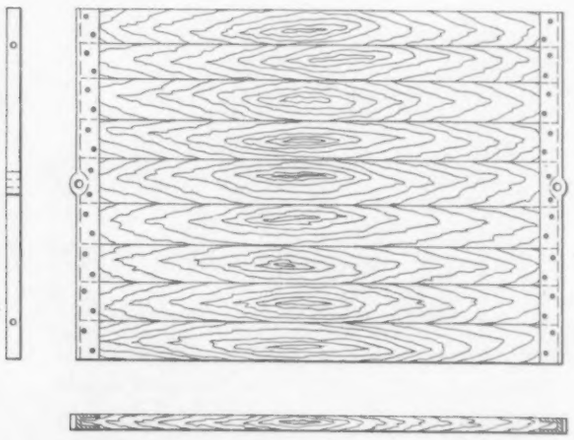


Fig. 3—The Standard Pattern Board Recommended for the Molding Machine, Drilled and Ready for Use

HOW TO OBTAIN THE BEST RESULTS

The best results in operating a jarring machine are obtained when the mold board bears uniformly on the machine. For this reason the carefully machined reinforcing irons are very important to the success of the machine.

The question of flask pins is one that should be given some thought. For all around use we recommend pins shown in Fig. 4. One of these pins is what we term the board pin, the other the flask pin. The part of the pin that is driven into the cope is made a little full to provide a driving fit; the shoulder on the same is to prevent the pin from being driven into the cope flask too far. The working part of the pin is made ⅞ in. in diameter and tapered as shown. This plan makes it possible to drill all holes in the flasks the same size and adds to the interchangeability of the flasks. The board pin is turned to ⅞ in. on both sides of the shoulder to make it possible to drop it into the pattern board while the drag is being rammed and to take it out, leaving the pin hole free for the pin in the cope when the cope is being rammed.

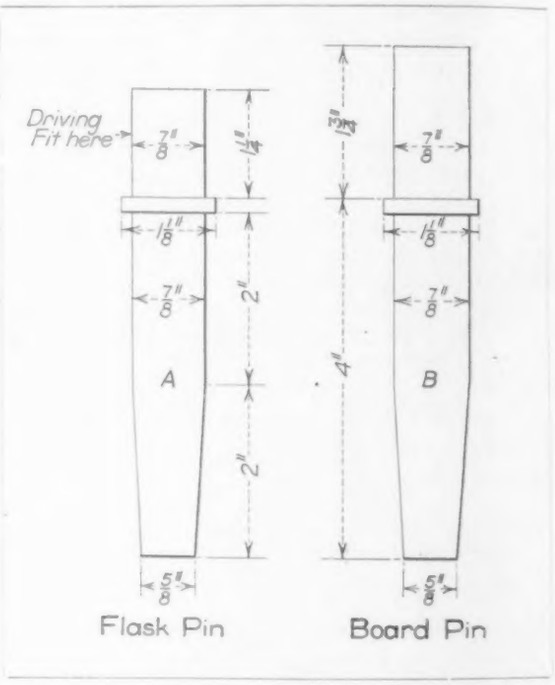


Fig. 4—Details of the Pins Used

Fig. 3 also shows a pattern board drilled and ready for use. The lumber for these boards should be thoroughly dried before using. A very good plan is to boil the lumber in a tank of paraffin, which prevents the wood from absorbing dampness from the sand. Where a specialty is being made day after day the boards and flasks should of course be made to fit the work more completely than the equipment described above, but we are now considering the jobbing foundry problem only.

As an illustration of the use of the standard flask Fig. 5 shows a cross-section and plan of two fire pots mounted on a board ready for molding the drag part of the mold in the standard flask shown in Fig. 1. While this is not the most economical method of making these castings, the small number required did not justify the making of flasks that would allow the pattern to be molded the other way up which would do away with the necessity of lifting plates. But because the most could not be realized out of the use of the molding machine on

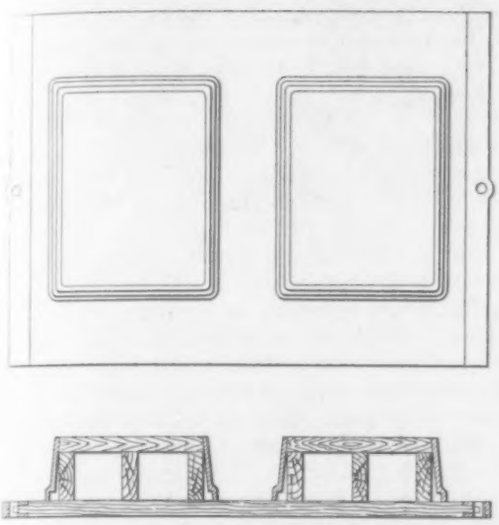


Fig. 5—A Cross-Section and Plan of Two Fire Pots Mounted on a Board Ready to Mold the Drag Part of the Mold Shown in Fig. 1

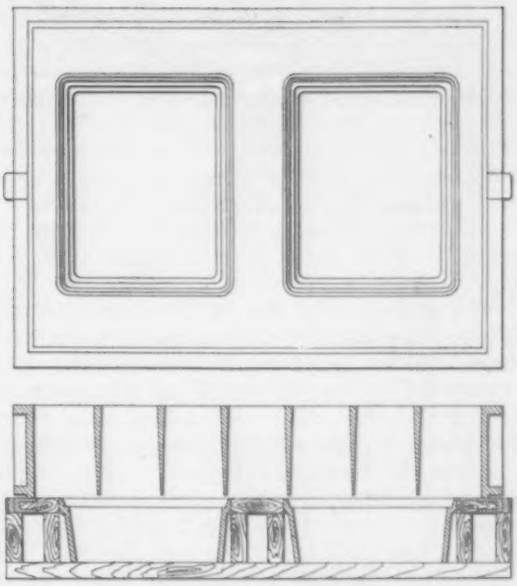


Fig. 6—The Plan and Cross-Section of the Cope Board for the Job Shown by Fig. 5

the job, we could see no reason why we should allow the job to be made by hand when at least 40 per cent could be saved in the productive labor with this crude method without special flasks. The drag patterns are mounted by securing two stools to the pattern board properly lined up with center lines. The outer edge of the stools fits the inside of the fire pot patterns snugly, which holds them in place while the drag is being jolted.

Fig. 6 is the plan and cross-section of the cope board for the same job. The same patterns are used, only in this case the inside portion of the pattern is exposed to the sand and the patterns are held to the center lines by the false frame or board. In order to use the standard flask with the straight bars this deep lift must be taken care of by the use of an arbor which is dropped into the patterns. When the cope is rammed, to avoid the danger of a poor lift, the flask and board is lifted and rolled over and the patterns drawn off of the cope by hand. This plan can be adopted in many cases where it is not advisable to make flasks or alter old ones for a job.

WHEN A SMALL NUMBER OF CASTINGS ARE WANTED

There are many cases where one is not justified in fitting a pattern to the mold board on account of the small number of castings required, or because the job is wanted at once and time cannot be allowed for mounting. In such cases a very good plan to keep the work on the molding machine is as follows: Lay the pattern for the drag on a smooth board, put on the drag part of the flask, fill the flask with sand and place it on the machine and ram. Lift the rammed drag mold off of the machine and roll it over. Place the cope part of the pattern in its proper place on the pattern that is rammed in the drag. Place the cope on the drag and wedge the cope pattern snugly between the cope bars. This is done by forcing several wedges between the top of the cope pattern and the bottom edge of the bars. Next put two or more wood screws into the cope pattern, allowing the loop end of the screws to extend above the top of the cope. Place a bar through each loop and wedge the same by putting a wedge between the ends of the bar and the top of the cope. Now the pattern is correctly located in the cope and secured so it will not move. It should be picked up, placed on the machine and rammed, lifted off the wood screw, removed, and the pattern drawn out. The wedges used between the bars and the cope pattern will leave a cavity that must be filled and made to conform to the shape of the rest of the mold.

This plan, when applied to large jobs, is worth considerable although it is not the best practice and should be resorted to only when the patterns for various reasons cannot be fitted to a board. There are a large number of flat backs that can always be made on the machine and the successful foundryman is always on the lookout for them. When a large flask is used (and it should be used whenever possible) a number of different patterns can be rammed in one flask.

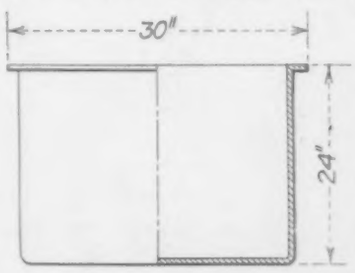


Fig. 7—A Kettle Casting to Be Molded on a Machine

RAMMING THE COPE BY HAND

There are many cases where a good flask cannot be secured and the cope must be rammed by hand. In such circumstances the man in charge of the shop should

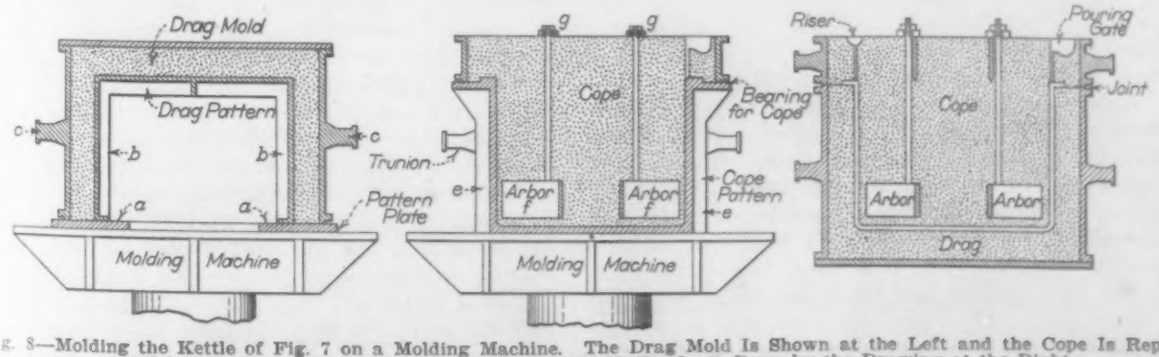


Fig. 8—Molding the Kettle of Fig. 7 on a Molding Machine. The Drag Mold Is Shown at the Left and the Cope Is Represented by the Center Drawing, and the Finished Mold, Ready to Pour, by the Drawing at the Right

have the large drag rammed and delivered to some molder's floor for completion. With tact and good judgment he can deliver these jobs to the men at such a time as to allow him time to complete the work before the metal is ready. The writer has in mind a foundryman who was getting five molds per days from one molder. He decided to ram the drags for the molders on the machine. As the drag was the largest part of the mold representing at least three-fourths of the job, he expected to gain considerable by having the molders ram the copes only. But he complained later that they only completed the five molds per day, even after he had rammed the drag for them. This is an instance where the man behind the machine counts. The fact that this foundryman was not able to get any benefit from the part of the work he did on the machine does not in any way prove that the machine was not a decided success, but rather the system of handling it was at fault.

SPECIAL FLASKS AND PATTERNS FOR SPECIAL JOBS

The kettle casting, Fig. 7, is subjected to steam pressure. When molded and cast after the cheapest and most simple method (bottom up) a great deal of trouble is experienced from leaks in the bottom when the castings are tested, or later while in service. To avoid this trouble it is necessary to cast the molds with the bottom of the kettle down. This appears a difficult molding machine problem unless a special rigging is provided as described here. To make the drag part of the mold, refer to Fig. 8, which is a cross-section of the drag mold rammed.

The special feature in this case consists of a flat metal ring *a* machined on both sides, with the kettle pattern *b* secured to it. The ring *a* is the same diameter as the outside of the flask which provides a support for the same, pin holes for the flask pins and produces a perfect joint on the mold. With the drag pattern arranged in this manner it becomes a washer board proposition to ram this part of the mold.

The operations are as follows: The flask is placed upon the ring *a* and filled with sand, placed upon the machine and jolted; when rammed hard enough the excess sand on the flask is struck off and a bed for the bottom plate provided. Instead of rubbing the board down to insure a uniform bearing the better way is to place the bottom plate on the bed of sand and allow the machine to jolt it down solid. After the mold is clamped it is lifted by the trunions *c*, rolled over and the pattern drawn out. This completes the drag part of this mold.

To produce the cope part of the mold, a metal pattern that will form the inside of the kettle only is used. This pattern is ribbed on the outside to make it strong enough to stand the jolting of the machine, Fig. 8. The open end of this pattern is provided with a flange which is a part of the same casting that forms the pattern. This flange is the same diameter as the outside of the metal cope and is used for the same purpose. The pattern ring is used in making the drag mold.

The operations are as follows: Place the required quantity of facing sand in the bottom of the pattern next to the arbor which rests upon supports that will hold it at least one-half inch above the pattern. Fill the pattern with sand, place the pattern on machine and start jarring while the cope part of the flask is being hooked up. Place the cope on the pattern, fill with sand and ram. Butt off the rammed cope with an air rammer, screw up arbor to straps *g*. Vent well, pick up the flask and pattern by trunions, roll over and draw the pattern. The plan of rolling over avoids all trouble experienced in poor lifts and reduces the work of securing 50 per cent. A cross section of this mold, completed and ready to pour, is shown in Fig. 8. While not the quickest way to make this casting, it is the quickest way to make it perfect.

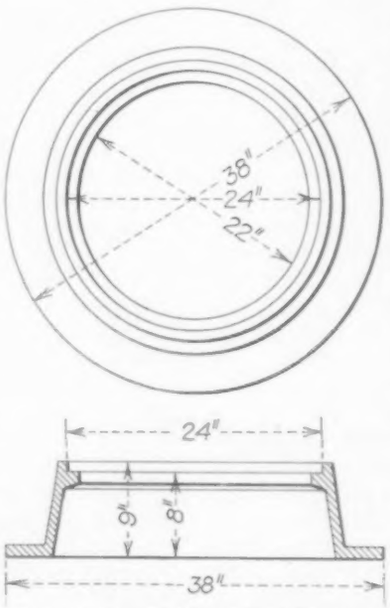


Fig. 9—A Casting Which Can Be Successfully Molded in the Opposite Manner to the Kettle of Fig. 7

ANOTHER SPECIAL JOB

Fig. 9 is a casting that can be successfully molded in just the opposite manner with the following rigging: In Fig. 10 the drag part of the mold rammed is shown. Note the combination of pattern and pattern plate. This pattern is filled with sand, placed on the machine, jolted, taken to the pouring floor, rolled over, clamps taken off, pattern drawn and is ready for another similar operation. The drag is simply a core box that does not require any rodding or venting. The cope part of this mold is also shown rammed, the same method of mounting the pattern having been resorted to. The flask is filled and rammed in the same manner, rolled over and drawn out of the cope. In some instances the cope is lifted direct from the pattern to the drag mold. A cross section of this mold complete, ready for pouring, is also shown.

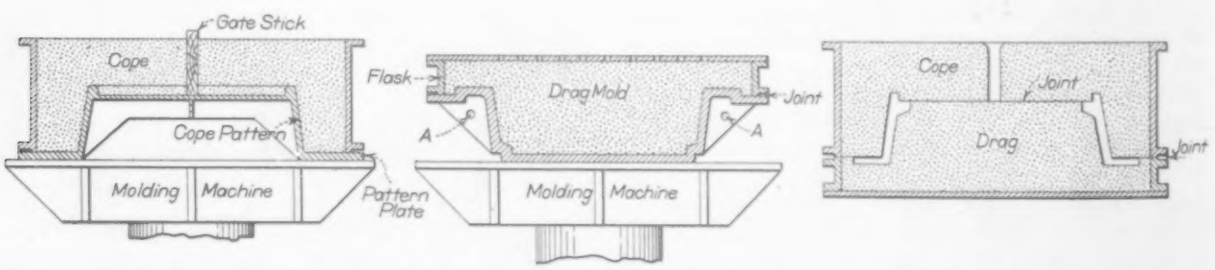


Fig. 10—Molding the Casting Shown in Fig. 9 on a Molding Machine. The Drag is Shown at the Center and the Cope on the Left While the Finished Mold is Represented by the Drawing at the Right

There is an unlimited number of stunts that can be used to secure 100 per cent efficiency from a molding machine in the jobbing foundry and on standard work, but we believe that the most important item is to keep the machine working at all times.

Decarburization in Heat-Treated Steels*

Its Determination by the Microscope Instead of by Chemical Analysis in Carbon Steels—Importance of Knowing the Extent and Causes

BY J. G. AYERS, JR.

When heat-treated steel parts are ground two objects are accomplished: The part is reduced to the finished size, and a suitable finish is given to the surface. When parts are to be subjected to sliding or rolling contact and their ability to resist wear is a desideratum, a third object should be accomplished by the grinding process. This is the removal of any decarburized surface envelope or skin which has been occasioned by the heat treatment, or any prior process in the manufacture of the steel. Under ideal conditions for heat treatment, this decarburization could be reduced to a minimum; but in many commercial hardening operations it is more or less present and is quite frequently ignored. To ascertain to what extent it takes place was the object of the investigation described in this paper.

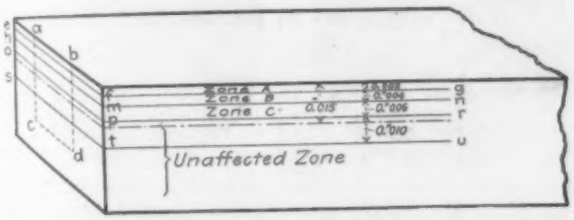


Fig. 1—Location of Sections of Which Photomicrographs Were Taken

The microscope was chosen as the most satisfactory means of investigation, for the chemical analysis of successive layers involves a very laborious and painstaking preparation of the samples. It gives, to be sure, a closer approach to the absolute carbon content than can be obtained by the microscope, but this is not a serious drawback, as the relative amount of decarburization is all the information generally desired.

NORMALIZING THE STEEL

In order, however, to examine micrographically the carbon content of a steel, it is necessary to submit the steel to a thermal treatment that will impart a structure in which the carbon-bearing portion or pearlite can be readily resolved from the other constituents. This necessitates heating the specimen to well above its critical range, followed by slow cooling, to obliterate the structure produced by any previous treatment, and to give the most favorable conditions for the complete precipitation of the pearlite. Unfortunately, this process of heating to about 1000 deg. C. is in itself conducive to surface decarburization, and we cannot be absolutely certain whether our conclusions are based upon the condition of the steel as regards carbon content before or after the normalizing treatment. In other words, we are producing possibly the very condition for which we are searching. It is, of course, customary to pack the specimen in some suitable material to prevent this effect, and while this may answer the purpose satisfactorily enough where the extreme surface is not under investigation, it will not do for the purpose under discussion, for the reason that the slightest access of gas included or generated in the packing material may produce an undesired effect.

In order to entirely eliminate this condition and to be certain that any decarburization noted had occurred in the heat-treatment or some previous treatment and not in the normalizing, all specimens were normalized in an atmosphere of nitrogen gas. This was readily accomplished by placing the specimen in a small gas-tight refractory tube, through which a stream of nitrogen passed from a tank of the compressed gas. This tube was inserted in a small Haraeus tube furnace to heat the specimen to the desired temperature.

The procedure adopted consisted in first preparing a photomicrograph of a cross-section of the specimen to make a preliminary survey under a medium low power. From a study of the photomicrograph of this cross-section an idea was obtained of the depth of the decarburized zone. As the transition from the zone of minimum to that of maximum carbon content was very rapid in the cross-sectional view, additional longitudinal sections were prepared at such depths below the surface as the cross-section photomicrograph suggested would be of value. From these longitudinal views which traversed zones of fairly constant carbon content an estimate of the degree of decarburization could be obtained.

Fig. 1 shows the location of the sections of which Figs. 2 to 6, inclusive, are photomicrographs. Fig. 2 is a photomicrograph showing a cross-section of the steel including the extreme edge of the specimen. Its location is *abcd*, Fig. 1. The scale across the center of Fig. 2 shows that decarburization extends to a depth of about 0.015 in. About 0.020 in. below the surface the normal carbon content is undisturbed and hence from this an opinion of the degree of decarburization can be

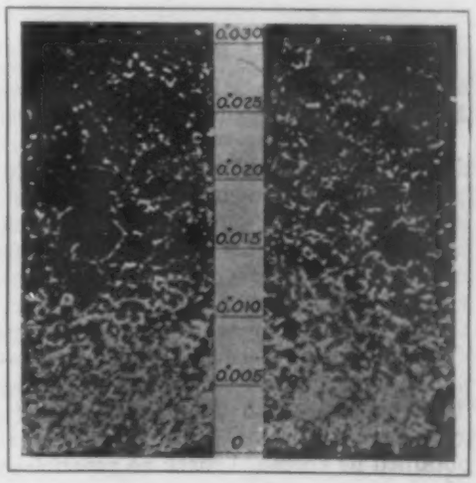


Fig. 2—Photomicrograph of Section *abcd* of Fig. 1

*From a paper presented at the eighteenth annual meeting of the American Society for Testing Materials at Atlantic City, June 22 to 26, 1915. The author is metallurgist for the Hyatt Roller Bearing Company, Newark, N. J.

formed, although this decarburization is much better shown in the longitudinal views to follow.

Fig. 3 is a photomicrograph of a longitudinal section 0.003 in. below the surface. It was taken on the plane located by *efg*, Fig. 1, and shows that the degree of decarburization at this depth was very marked. This evidence is in accord with the cross-sectional view just observed above. Sorbitic pearlite occupies only about 25 per cent of the total surface.

Fig. 4 shows a longitudinal section 0.007 in. below the surface on the plane *hmn*, Fig. 1. It does not show such marked decarburization, sorbitic pearlite occupying about 45 per cent of the total surface.

Fig. 5 shows a longitudinal section 0.013 in. below the surface on the plane located by *opr*, Fig. 1. It exhibits still less the effects of decarburization, sorbitic pearlite occupying about 70 per cent of the total surface.

Fig. 6 shows a longitudinal section 0.023 in. below the surface. It is on the plane located by *stu*, Fig. 1, is well within the unaffected zone and is representative of the normal carbon content of the piece. Sorbitic pearlite occupies about 80 per cent of the total surface.

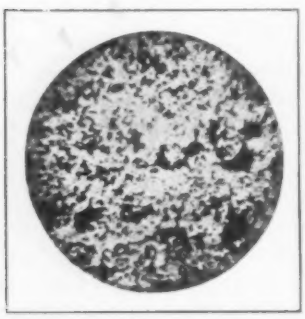


Fig. 3—0.003 In. Below Surface. Sorbitic Pearlite, 25 per Cent.

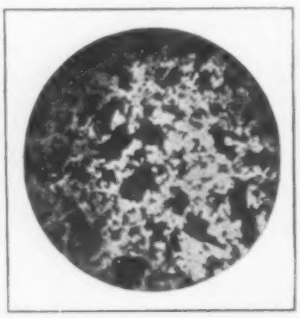


Fig. 4—0.007 In. Below Surface, Sorbitic Pearlite, 45 per Cent.

Fig. 5—0.013 In. Below Surface. Sorbitic Pearlite, 70 per Cent.

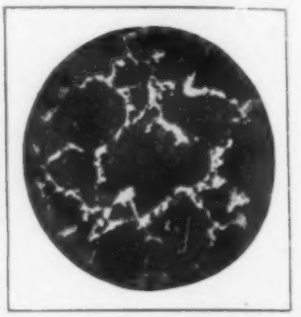


Fig. 6—0.023 In. Below Surface. Sorbitic Pearlite, 80 per Cent.

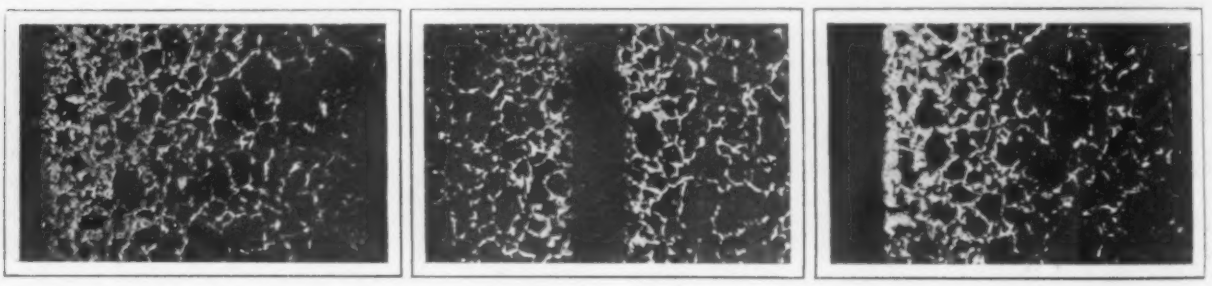


Fig. 7 (Left)—Small Hot-Rolled Section as Furnished by Mill, Magnified 77 Dia. Fig. 8 (Center)—Same Steel as Fig. 7, Heated to 790 Deg. C. for 3 Hrs. and Quenched in Oil. Two Portions of the Specimen Are Shown with Decarburized Edges Facing Each Other, Magnified 69 Dia. Fig. 9 (Right)—Same Steel as Fig. 7, Heated to 790 Deg. C. for 9 Hrs. and Quenched in Oil, Magnified 77 Dia.

ESTIMATING THE DECARBURIZATION

We are now in a position to form an estimate of both the extent and the degree of the decarburization. In estimating the amount of carbon micrographically, care should be exercised to determine exactly upon what micro-constituent the determination is based. If the experimenter's normalizing treatment does not result in pearlite of eutectoid carbon content a factor should be determined for each type of steel handled, and for the particular normalizing treatment; otherwise, determinations will often be wide of the mark. This is due to the fact that different rates of cooling in the normalizing treatment result in different phases of pearlite, including sorbite itself. After a factor has once been obtained by chemical check no repetitions need be made.

The specimen under discussion showed about 80 per cent of sorbitic-pearlitic areas in Fig. 6. If we consider them as pearlite containing 0.85 per cent carbon, this view would depict a spot of 0.80×0.85, or 0.68 per cent carbon. Chemical analysis gave 0.45 per cent. This illustrates the point dwelt upon above. If, on the other hand, we assume that 80 per cent of sorbitic pearlite corresponds in this particular case to 0.45 per cent carbon, we have a more consistent factor to work by, and hence we deduce the following:

Fig. 3, representing the maximum carbon content of zone *A*, Fig. 1, shows 25 per cent sorbitic pearlite, or 0.14 per cent carbon;

Fig. 4, representing the maximum carbon content of zone *B*, shows 45 per cent sorbitic pearlite, equivalent to 0.25 per cent carbon;

Fig. 5, representing the maximum carbon content of zone *C*, shows 70 per cent sorbitic pearlite, equivalent to 0.39 per cent carbon.

If, on the other hand, we desire to ascertain only the relative degree of decarburization in each zone, as compared with the original content, we need no recourse whatever to chemical analysis. Inasmuch as Fig. 6, which represents the zone unaffected by decarburization, contains 80 per cent sorbitic pearlite, zones *A*, *B* and *C*, containing 25, 45 and 70 per cent sorbitic pearlite respectively, have lost by decarburization about 69, 44 and 12.5 per cent respectively of their original carbon content.

From an estimate of this nature, the metallurgist can ascertain just how much should be ground from the piece to satisfy his particular requirements. In the case of the piece just examined it is manifestly evident that at least 0.015 in. must be removed from the surface to entirely remove all traces of decarburization. It is obvious that this piece has not been properly manipulated either in the heat treatment or the mill.

CAUSE DUE TO MILL OR HEAT TREATMENT

This conclusion gives rise to the question as to whether the cause lies with the mill or the heat treatment, or possibly a combination of both. This can, of course, be readily determined by a micrographic examination before any heat treatment has been attempted. Results will no doubt differ considerably for different types and sections of steel finished by different processes and made for diverse purposes.

Fig. 7 shows a cross-section of a small hot-

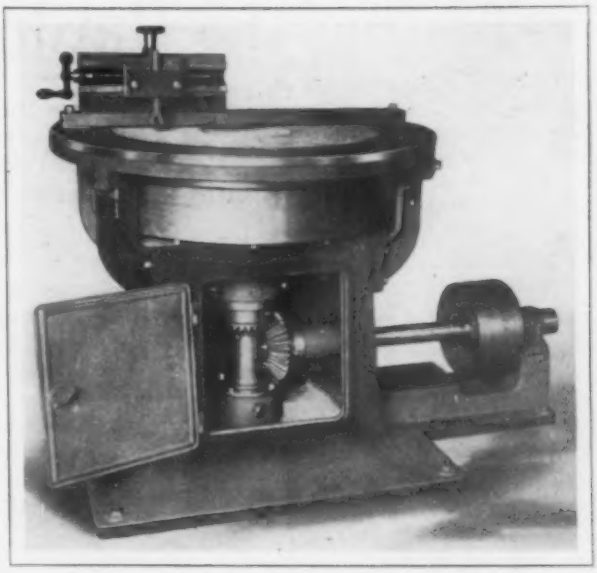
roll section as furnished by the mill. With the exception of normalizing, it has been given no further treatment. It shows evidences of decarburization to a depth of about 0.010 in. Fig. 8 shows a piece of the same steel. All the zone decarburized by the mill was removed and the piece was then heat treated according to the practice in vogue for its particular application. This consisted of heating to about 790 deg. C. for 20 min. and then quenching in oil. In this case, however, the time in the furnace was purposely prolonged to a period of 3 hr. to accentuate any decarburizing effects. It will be noted that the decarburized zone is not over 0.005 in. and hence less than that produced by the mill. Another piece of this same stock similarly prepared but kept in the furnace 9 hr. is shown in Fig. 9. Here it will be observed that the decarburization is about as deep as that produced by the mill. We therefore note that in this particular instance the mill was the most potent factor in causing decarburization, as that caused by heat treatment was not very marked, except where the duration of the time in the furnace was abnormally prolonged.

In conclusion, it may be stated that surface decarburization frequently exists in heat-treated steel parts, due either to the mill practice or to the heat treatment itself. From whatever cause, it should be investigated by the metallurgist and its extent ascertained. The microscope is undoubtedly the most efficient means of accomplishing this purpose in hypo-eutectoid steels. When the exact cause and extent have been determined, means may be provided for correcting it—at least to a certain extent. In the grinding operation, however, there sometimes lies the opportunity of entirely removing its deleterious effects by a judicious determination of the grinding limits, and in this the metallurgist should play a more conspicuous part than he has in the past.

New Upright Surface Grinding Machine

For grinding flat surfaces on a large variety of work that can be laid on the face of the wheel or held in place by hand, the Bridgeport Safety Emery Wheel Company, Bridgeport, Conn., has developed a vertical spindle grinding machine. A special type of chuck is used to mount the wheel and a steel cross bar is bolted across the top of the work table. This bar has a place for fastening the attachment used for truing the wheel and is also relied upon to serve as a stop to prevent large work from turning with the wheel.

The wheel, which is 30 in. in diameter with a depth of 8 in., is surrounded by a work table measuring 42½ in. across. This table serves as a place upon which to rest work that is being ground. The body of the chuck holding the wheel is a solid steel casting which is made thicker near the front edge where the majority of the strain comes. The inside of the chuck is tapered and there is a series of plain independent jaws, the number of which varies with the diameter of the chuck, that fit down on the emery wheel and hold it in place. A screw in the back of the chuck body casting is used to move the jaws in or out as desired, and side guides with a dovetail bevel face riveted on the inside of the chuck are relied upon to maintain the jaws in the proper position at all times. On the inside of the body casting a long hub is fastened to the spindle with a spline, an arrangement which tends to provide a long bearing surface, keep the parts in alignment and eliminate slippage. A back plate screws over the outside of the hub, which is threaded and forms



An Upright Grinding Machine for Producing Flat Surfaces on Work That Can Be Either Held by Hand or Laid on the Face of the Wheel. The wheel truing attachment is shown in place and the door in the base is open to give an idea of the driving mechanism.

a back that follows the ring wheel as it is worn away, taking the load or end thrust of the work against the grinding wheel. A light weight octagon nut which screws on the end of the spindle against the hub of the chuck keeps the latter in position.

The upper bearing of the chuck on the spindle has a taper bronze bushing and lock nuts to compensate for wear while the lower bearing is equipped with a radial and ball thrust bearing. As the wheel wears away it is raised by releasing the jaws and turning the back plate with a long handled wrench. A large pin or bolt on the side of the base that slides into a hole on the under side of the chuck serves to lock the spindle while this adjustment is being made.

The machine is driven from a countershaft through a belt connection to the tight and loose pulleys on the machine. From the driving pulley of the machine the power is transmitted through the horizontal shaft to a fiber bevel gear which meshes with one on the vertical shaft and causes the wheel to revolve. The arrangement of the driving gears is brought out in the accompanying illustration.

Across the top of the work table a steel cross bar measuring 1¼ x 3 in. is bolted to which a slide rest is attached for truing the wheel. This cross bar also forms a stop for large work placed on the table to go up against and prevents it from turning with the wheel. This feature is also shown in the accompanying illustration.

The top of the table is 37½ in. from the floor. The machine occupies a floor space of 40 x 65 in. and weighs approximately 3550 lb. when crated for domestic shipment.

The Pacific Hardware & Steel Company, San Francisco, Cal., has undergone a reorganization. W. T. Smith has been elected president, and A. L. Scott and H. J. Morton have retired from the board of directors. Banks holding about 85 per cent of the company's indebtedness have agreed to give an extension of six months, which will enable the company to work out its affairs without impairment to its credit. It is stated that the accounts show an apparent surplus of $700,000 in asests over liabilities. The capital stock of the company is $5,000,000, of which $3,000,000 is 7 per cent cumulative and $2,000,000 is common stock. Of the preferred, $2,171,100, and of the common $1,732,250 are outstanding.

Testing the Hardness of Iron Castings

Its Relation to the Strength and Properties of Gray-Iron and Chilled Castings—A New Method of Determining Hardness by the Ball Impression Test

BY G. S. EVANS*

In the last few years considerable progress has been made in developing various types of testing machines for determining the physical properties of iron and steel with a view to improving their strength and other physical properties. This is a natural result of the engineer's cry for a stronger and better material with which to construct higher sky-scrapers, lighter automobiles, more reliable flying machines and the many other engineering developments of the present age.

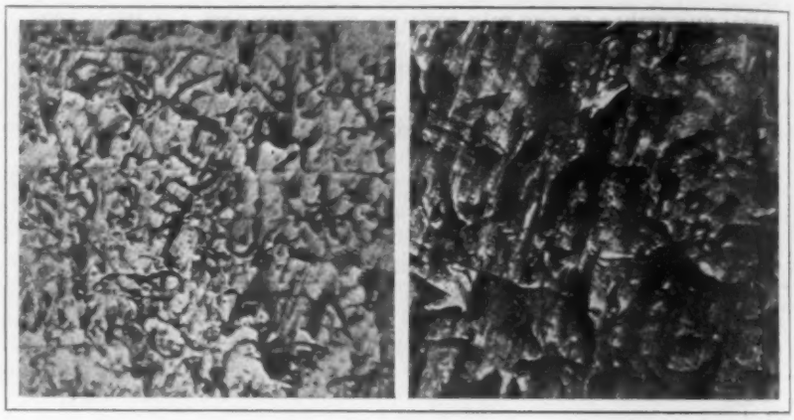
Among the more important physical tests to which iron and steel are submitted there is one which, until recently, has received comparatively little commercial application. This is the hardness test. Investigators have found that there exists a very close, if not definite, relation between the hardness and ultimate tensile strength of iron and steel. With ordinary carbon steel it is possible, when knowing the hardness, to approximate the tensile strength to within 2½ per cent. of its tested value.

One of the oldest methods of determining hardness is to ascertain the resistance to scratching. Other methods measure compressive hardness by determining the resistance offered to indentation by another body. A measurement of elasticity is made use of in some methods, while in others toughness or resistance to cutting tools is determined. Of the many methods several have lately come into use on account of the possibility of their commercial application. One of these used extensively is that devised by Brinell. It is dependent upon the resistance offered by the sample to indentation.

The important features of the ball impression method of testing hardness are its rapidity, simplicity of manipulation, accuracy of the results obtained and the possibility of determining the hardness of an object without injury to the sample. This feature is made use of by many consumers of rolled steel and is extensively used by automobile builders in testing the frames, axles and other important parts of an automobile prior to assembling.

Manufacturers and users of rolled steel and steel products were quick to see the value of this method of testing, so that today the hardness test is being made use of in a great number of plants in controlling the quality of their output. Although the hardness test is of equal, if not greater, value to producers of chilled, malleable and gray iron castings, it is seldom used in this connection.

Tables 1, 2, 3 and 4 show a few examples of the relation between hardness, strength and other properties of chilled carwheels, chilled moldboards, light gray-iron castings and gray-iron test bars. These are isolated cases selected from among the few tests that I have been able to make, and are given not as con-



Figs. 3 and 4—Photomicrographs of Gray-Iron Castings, Magnified 100 Diameters, Etched with Picric Acid. Hardness Numeral of Fig. 3 (Left) is 185; of Fig. 4 (Right), 128

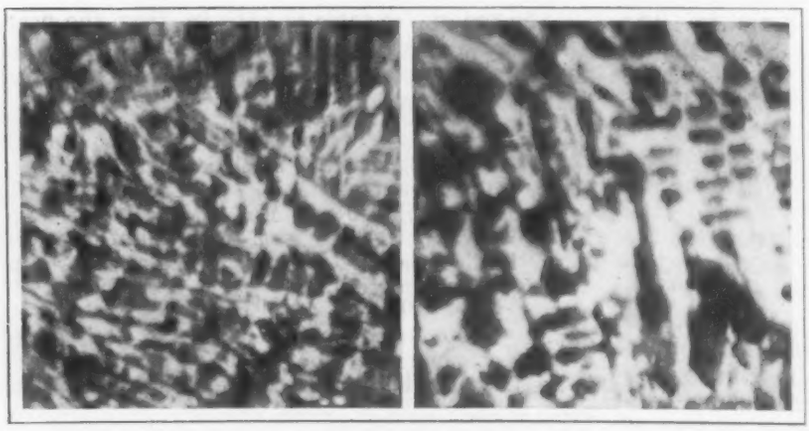
*Foundry superintendent Lenoir Car Works, Lenoir City, Tenn.

Table 1.—Showing the relation between hardness and the strength of chilled carwheels

Sample	Hardness of single plate	Hardness of surface of chill	M. C. B. DROP TEST NUMBER OF BLOWS		M. C. B. THERMAL TEST MINUTES TO CRACK	
			To crack	To break	In plate Min. Sec.	Through tread Min. Sec.
1	125	444	53	101	.....	.....
2	140	....	31	79	.....	.....
3	176	472	15	31	.....	.....
4	196	513	6	11	.....	.....
5	196	....	..	....	1 41	2 06
6	199	....	..	....	0 53	1 17
7	147	....	..	....	No crack at 5 min.	
8	163	....	..	....	No crack at 5 min.	

Table 2.—Showing the relation between hardness and the soil-shedding qualities of chilled moldboards

Sample	Hardness of polished surface of moldboard	Shedding qualities
1	512	Shedded soil exceptionally well
2	502	Shedded soil exceptionally well
3	466	Shedded soil poorly
4	418	Shedded soil very poorly



Figs. 1 and 2—Photomicrographs of Chilled Moldboards, Magnified 500 Diameters, Etched with Picric Acid. Hardness Numeral of Fig. 1 (Left) is 512; of Fig. 2 (Right), 466

clusive evidence but serve to demonstrate in a limited way the possibility of the value of hardness tests in studying the properties of cast iron.

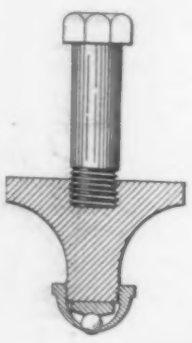
The hardness of an iron is dependent upon its structure; then, knowing the hardness we should be able to judge as to the structure and, vice versa, knowing the structure we can estimate the hardness. This relation between hardness and the microstructure of an iron is illustrated by Figs. 1, 2, 3 and 4. Figs. 1 and 2 show the structure of samples 1 and 3 of Table 2, each of 500 magnifications, etched with picric acid. These are both hyper-eutectoid irons, in which the light area of the photograph represents cementite and the dark area pearlite. It will be noticed that the percentage of cementite is greater and more evenly distributed in Fig. 1; this is harder than pearilte and accounts for the greater hardness of this sample.

Figs. 3 and 4 show the structure of samples 5 and 6 of Table 3, each at 100 magnifications, etched with picric acid. These are hypo-eutectoid irons and differ from Figs. 1 and 2 in that the light area represents ferrite; the dark gray, pearlite, and the very dark, graphite. The dull grayish irregular area occurring in Fig. 4 is probably steadite. The higher percentage of pearlite, which is harder than either ferrite or graphite, accounts for the greater hardness of sample No. 3 over No. 4.

The foregoing would indicate a rather definite relation between hardness and microstructure, and since it is generally recognized that the property of an iron is dependent upon its microstructure, it is evident that this method of testing is invaluable in studying and controlling the properties of cast irons for different purposes, and it is of special value in controlling chilled-iron mixtures such as plow points, moldboards, carwheels, chilled rolls, etc.

There are several different makes of special machines for making the ball impression test, but in the absence of these it can be made with considerable accuracy on an ordinary universal tension-compression or a transverse testing machine, capable of exerting and accurately measuring the required pressure, by using special attachments made adaptable to the particular machine. Two different types of such attachments are illustrated in Figs. 5 and 6. Fig. 5 shows a sectional view of the attachment designed especially for use with a Riehle 100,000-lb. capacity universal testing machine, and Fig. 6 a perspective view of the attachment applied to a Tinius-Olsen 10,000-lb. capacity transverse testing machine.

To make the test with a universal machine it is arranged as for a compression test; with a transverse machine the sample being investigated is placed upon a transverse support and the pulling head, to which the attachment is fastened, is arranged midway between the two supports, as illustrated by Fig. 6. In making the compression the ball is first brought into contact with the plane surface of the specimen, the weight on the beam is next set to the required load and the pressure gradually applied until the beam floats, the time noted and sufficient additional pressure applied, if necessary, to keep the beam floating for 15 seconds, after which the load is removed and the diameter of the spherical indentation measured in millimeters. It is best to make two or more impressions on each sample and take the average of the final result, otherwise local irregularities in the specimen and probable variations applying the pressure may sometimes give erroneous results. However, if the test is carefully carried out in all its stages the results will each be found fairly representative of the sample. Further, tests made in this way will be found to check very closely with tests made



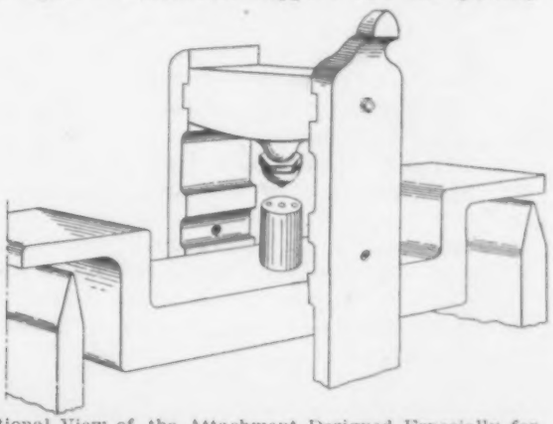


Fig. 5 (Left) Shows a Sectional View of the Attachment Designed Especially for Use with a Riehle 100,000-Lb. Testing Machine. Fig. 6 (Right) is a Perspective View of the Attachment Applied to a Tinius-Olsen 10,000-lb. Transverse Testing Machine

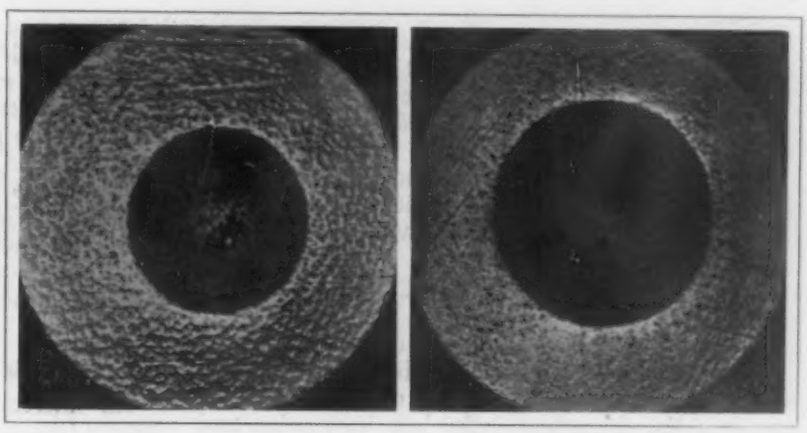


Fig. 7—Enlarged Photograph of the Impression Made on Sample No. 1 of Table 3, Magnified 9 Diameters. Hardness Numeral is 202

Fig. 8—Enlarged Photograph of the Impression Made on Sample No. 3 of Table 3, Magnified 9 Diameters. Hardness Numeral is 143

Table 3.—Showing the relation between hardness and the strength machineability of light gray-iron castings

Sample	Hardness of section	Relative drilling time through ½-inch section with a constant pressure Min.	Sec.	Comparative strength or brittleness
1	202	4	41	Comparatively strong, but very brittle
2	215	4	53	Comparatively strong, but very brittle
3	143	2	2	Strong and more ductile
4	156	2	7	.....
5	185	.....		Showed good strength
6	128	.....		Showed good strength

Table 4.—Showing the relation between hardness and the transverse strength and deflection of 1¼" round test bars

Sample	Hardness	Kind of iron	Breaking load with 12 in. between supports	Deflection in 100ths inches
1	137	Carwheel	3,300	0.176
2	205	Carwheel	4,150	0.122
3	196	Semi-steel	4,295	0.173
4	217	Semi-steel	4,430	0.162
5	116	Machinery	2,470	0.139
6	153	Machinery	3,240	0.185

on the more expensive Swedish machines designed especially for this method of hardness testing.

In order to obtain correct comparative results it is necessary that uniform conditions be maintained. A standard set of conditions should be established for each general class of materials such as chilled cast iron, ordinary gray cast iron, structural steel and non-ferrous metals. A 10 millimeter ball with a load of 5000 kilograms (11,023 lb.) is recommended for testing chilled iron; 3000 kilograms (6614 lb.) for gray iron and steel, in each case subjecting the sample to the pressure for 15 seconds; and a load of 500 kilograms (3307 lb.) for testing non-ferrous metals, subjecting the sample to the pressure for 30 seconds.

Figs. 7 and 8 are enlarged photographs of the impressions made by a 10 millimeter ball under a load of 3000 kg. on samples 1 and 3 of Table 3; these are magnified 9 diameters from original diameters of 4.25 and 5 millimeters and show the relative size of the impressions for the hardness numerals 202 and 143 respectively, when tested with a 10 mm. ball under a load of 3000 kilograms. The hardness numerals are inversely proportional to the size of the impressions, i.e., the smaller the diameter of the impression, the greater the hardness number, and, vice versa, the larger the diameter, the smaller the number; or, in other words, the hardness number varies in direct ratio to the hardness of the material, i.e., the greater the hardness number, the greater the hardness itself.

The hardness number is found by dividing the load by the area of the impression. This may be accomplished by use of the following formula:

$$\text{Hardness} = \frac{P}{\frac{\pi D}{2}(D - \sqrt{D^2 - d^2})}$$

P is the load, D the diameter of the ball and d the diameter of the impression. With the aid of the Brinell table of hardness it is only necessary to measure the diameter of the ball impression and find the hardness number corresponding to the diameter.

The writer, realizing the importance of the hardness test in studying the values of different carwheel mixtures, and the effect of annealing on the strength and wearing qualities of the chill, etc., and being unable to obtain appropriations with which to buy the expensive Brinell hardness testing machine, devised the attachment shown in Figs. 5 and 6, for use with the ordinary transverse testing machine at hand. This has been in constant use for about two years and has proved itself of great value both in the wheel and gray-iron foundry.

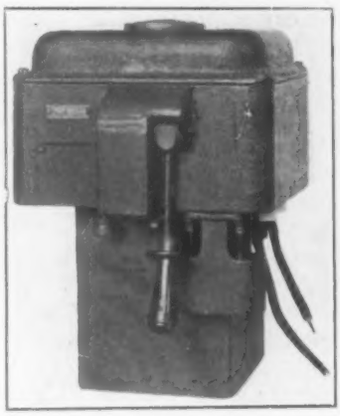
It is also used in testing the structural steel used in the car department, and is indispensable in tempering tool steels, such as pneumatic rivet headers, dies and other tools subject to heavy duty.

The hardness testing attachments here described are protected by United States letters patent, No. 1,120,461.

Eddystone, Pa., which is the location of a branch plant of the Baldwin Locomotive Works, is attaining prominence as an industrial community through the enlarged operatons of that company, the Tindel-Morris Company and other manufacturing establishments in the vicinity. Local real estate men and builders were recently called together by a representative of the Baldwin Works and advised that 2000 new houses would shortly be needed to supply the great increase being made in working forces. The Tindel-Morris Company has increased its plant 100 per cent in the past year. It recently placed in operation a new department for the manufacture of high pressure seamless gas tanks.

Improved Industrial Type Oil Switch

The General Electric Company, Schenectady, N. Y., has developed an oil switch for use in industrial establishments to control and protect induction motors up to 2500 volts and 300 amp. Two forms are made, one for simply starting and stopping the motor, while the other, which is known as the automatic type, will operate to cut the current off from the motor should an overload greater than that for which the overload trip is set occur. Any vertical flat surface, such as a wall or post, can be used to mount the switch, or if desired it can be located on the machine driven by the motor.



An Oil Switch with Self Contained Transformer for Low Voltage Release Intended for Use with Induction Motors in Industrial Plants

If desired, a low voltage trip can be added to both types of switch if that is found desirable at any time subsequent to their installation, and a series-overload trip can also be added to the non-automatic switch. The calibrating tubes and dashpots used with the time limit overload trip are protected from injury by a cast-iron guard which has been added to the equipment. Covers arranged for mounting a round pattern ammeter can also be furnished for the switches.

Booklet on Colored Lenses

An interesting booklet on colored lenses for industrial use has been published by the Julius King Optical Company, 10 Maiden Lane, New York City. It emphasizes strongly the harmful invisible rays from brilliant light sources, which rays need to be absorbed by the lenses of eye protecting goggles. The complete spectrum has been reproduced in colors in the booklet and diagrams in that connection have been drawn to show the field of the harmful ultra-violet rays and the harmful infra-red rays. These combined diagrams show the absorptive powers of different kinds of glass for light sources at temperatures around 2000 deg. Fahr. for example, and at 3500 deg., 4300 deg. and 6400 deg., and they show also how clear glass, cobalt blue glass, red glass, green glass and smoke glass fail to intercept to a desirable degree the harmful rays. A table is also given of the correct glasses for and temperatures corresponding to different processes, such as the electric arc welding, oxy-acetylene welding and cutting and the protection of the eyes in judging metal conditions, as in blast furnace operation, at the open hearth furnace, or at the Bessemer converter, soaking pits, gas heating furnaces and the like. It is stated that over 90 per cent of the colored glass used to-day to protect the eyes from glare and violet light is decidedly injurious. The reproductions of spectra are based on researches made by Prof. M. Luckiesh and were prepared by Frederick W. King, manager of the safety department of the company.

The statement in the daily press that work is about to be begun on the construction of tin-plate mills at the sheet plant of the American Sheet & Tin Plate Company at Gary, Ind., is at least premature. No appropriation has been made for such new construction, and there is no expectation of entering upon it this year, though the original plans for the above company's works at Gary contemplated the ultimate building of tin-plate mills.

A Rotary Surface Grinding Machine

A new type of 8-in. rotary surface grinding machine has been placed on the market by the Pettibone-Arter Machine Company, Worcester, Mass. It is designed particularly for heavy production work and the special features embodied in its construction include an automatic reversing mechanism and an arrangement for enabling the chuck spindle drive to be disengaged without stopping the wheel spindle.

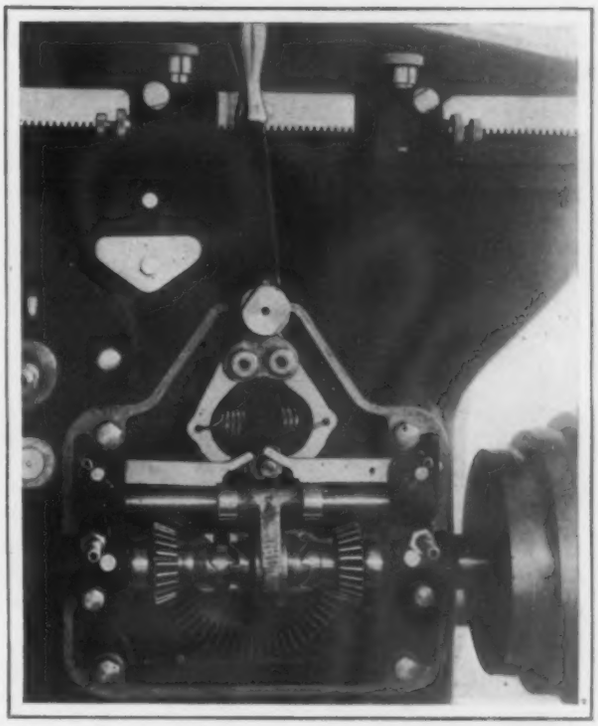
The construction of the wheel head has been made massive with a view to reducing vibration as far as possible, and this is supplemented by the use of a flexible spring idler pulley in connection with the wheel spindle drive, the function of the pulley being to absorb all blows, due to inaccuracy of the belt which might otherwise be transmitted to the wheel spindle. The wheel spindle, which is driven by 3-in. belt, is of heat treated chrome nickel steel and has bronze bearings 4½ in. long. A new design of friction clutch forms a part of the wheel head drive. If due to inattention on the part of the operator the wheel head should strike the water pan, the clutch will slip, thus preventing damage to the machine.

In the automatic reversing mechanism for shifting the clutch sleeve a spring which is in constant tension effects the throwing of the sleeve in both directions. It is pointed out that the quick action of this single spring mechanism makes it possible to reverse the wheel head within ½ in. The reversing dogs used in connection with this mechanism are of a peculiar type and operate on an inverted rack. Downward pressure on the cap of the dog disengages it from the rack, and when the dog has been brought to the desired position the pressure is removed and the dog automatically re-engages itself. With this arrangement the operation of the dog is simplified, as it is unnecessary to use spanners or manipulate levers and the inversion of the rack keeps it free from dirt.

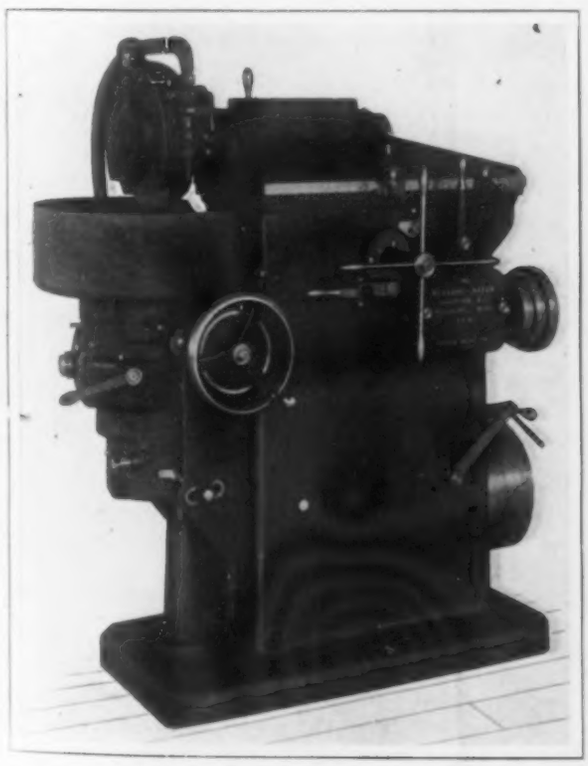
The mechanism which operates the magnetic chuck enables the drive for the chuck spindle to be disengaged without stopping the grinding wheel spindle, and thus permit the wheel to be trued as well as facilitating the rapid readjustment of work on the chuck. A broad cone-shaped spindle resting in a heavy bronze bearing supports the chuck and provides an automatic adjustment for taking up wear. A taper gib extending the entire length of the slide provides for the adjustment of the chuck slide. A number of different feeds are provided for the chuck spindle and the wheel feeding mechanism, the drives being interlocked with a view to maintaining the same relative feed per revolution of the chuck. The cone pulleys on the countershaft driving the chuck are let into the body of the machine, an arrangement which it is emphasized permits the universal shaft to the spiral gear of the chuck drive to operate in the same vertical plane at all times. The bearing bracket for the chuck spindle can be adjusted at an angle to permit dished or conical work to be ground, and it is pointed out that the use of a special type of drive eliminates vibration irrespective of the angle to which the chuck may be elevated.

A water tank and pump provide the necessary water for use during the grinding operations, and the water pan which houses the chuck has been designed with a bottom sloping toward the drain. The drain itself is inclosed in a pocket or cup, this arrangement being relied upon to break the whirl of the water about the inner wall of the pan and concentrate the flow upon the drain.

The machine has a capacity of 10 in. on the chuck surface and the vertical adjustment is 13 in. When the machine is installed the only work that has to be done is to connect it to the main line shaft.



The Automatic Reversing Mechanism for the Clutch Sleeve Showing the Reversing Dogs on an Inverted Rack and the Spring Which Is Under Constant Tension and Throws the Sleeve in Either Direction



An 8-In. Rotary Surface Grinding Machine Designed for Heavy Work and Equipped with a Special Type of Automatic Reversing Mechanism

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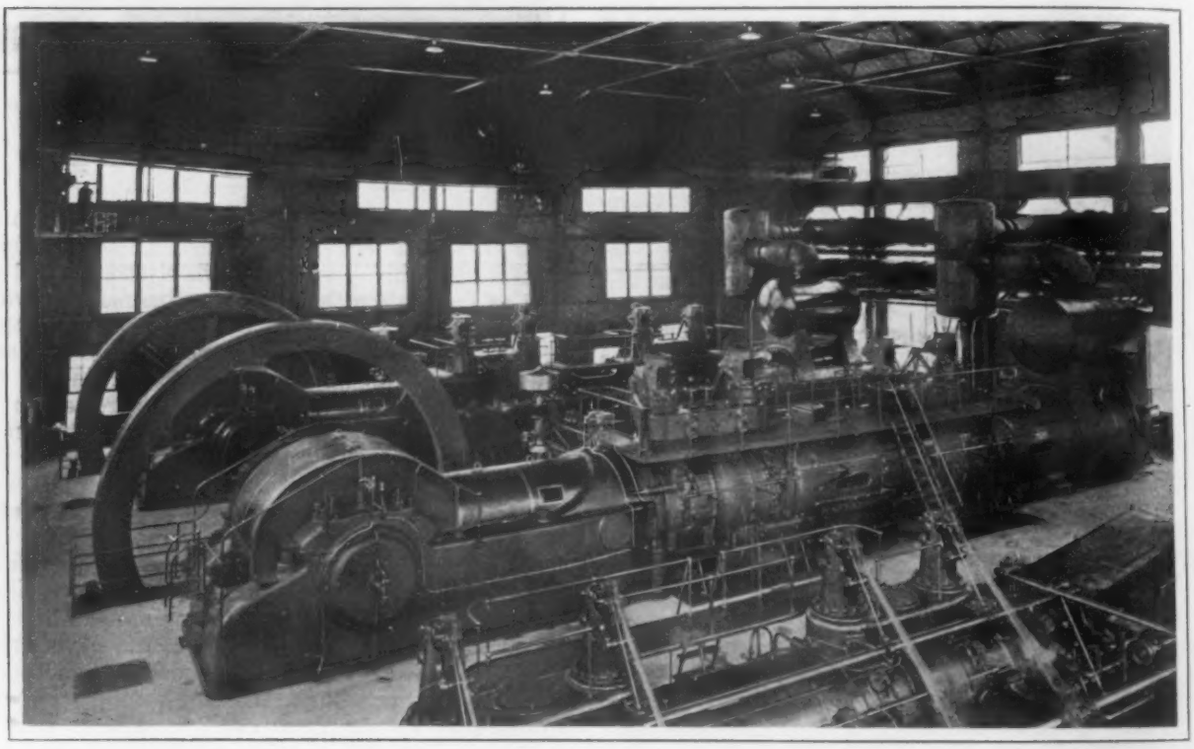
The Bethlehem Steel Company has been awarded a decision by the Circuit Court of Appeals reversing a ruling of the United States District Court which held that it had infringed on a patent owned by the Firth-Sterling Steel Company covering the manufacture of armor-piercing projectiles.

Blowing Engines for the Pennsylvania Steel Company

Some further details have been obtained of the large gas-operated blowing engines built for the Pennsylvania Steel Company at Steelton, Pa., by the Mesta Machine Company. They supplement the account given in THE IRON AGE of March 4. Briefly, the engines typify the higher piston speeds, the simplification of valve gearing and the automatic lubrication which mark the progress in blast furnace blowing equipment.

Each engine consists of two 46-in. gas cylinders and one 84-in. blowing cylinder in tandem. The elimination of valve gearing has been made possible by the use of the Mesta automatic Iversen patent plate valve. The position of the blowing cylinder back of the gas cylinder allows for using the center crank, which was adopted because the bending moment on the shaft is reduced to such an extent that a shaft of relatively small diameter can be used. The company considers it somewhat surprising that



Two Mesta Single Tandem Center-Crank Gas Blowing Engines at Steelton Plant of Pennsylvania Steel Company

American engineers should have held so long to the side crank construction in gas engines, when a very simple calculation shows the advantages of the center crank for heavy stresses.

The Mesta engine follows the recent tendency in gas blowing practice to make blowing engines of the single tandem design rather than to build twin engines. The cylinders are in halves of fairly soft close-grained air-furnace cast iron. It is held that by the use of this grade of iron there is less chance for fire cracks than with iron of a harder grade. To obtain a good wearing surface the cylinders are lined with a hard close-grained iron bushing extending over the entire stroke of the piston.

The engine at the Pennsylvania Steel plant can be started and put on the furnace in less than 1 min. This rapidity of handling is made possible, it is emphasized, by the concentration of all the operating levers and hand wheels on one operating stand. One of the illustrations shows the switchboard and the control hand wheels. When the signal is received from the furnace to slow down the engine, a switch, thrown in at the control stand, changes the tension of the spring in the governor column and thus reduces the speed. As soon as the desired speed is obtained the switch is pulled out. The speed-changing device, which is operated by motor drive, is provided with limit switches to make it impossible for the engineer to exceed the speed change limit set by the designer of the engine.

The exhaust valves are not water cooled. The valve seat is cooled and the valve itself, it is found, can convey enough heat to the valve seat to protect itself. Theoretical calculations and actual measurements show that the gases passing the exhaust valves are never hotter than 1100 to 1150 deg. Fahr., unless combustion is sluggish during the explosion stroke and continues up to the time when the gases pass through the valve into the exhaust.

The oiling system consists of two individual filters, one for each engine, the filters being placed as one unit with one large clean oil receiver. The oil from this receiver is pumped into the system by means of a motor-driven triplex pump running at a slow speed to prevent churning the oil. The pump delivers the oil to the system at a pressure of 30 lb. per sq. in., and is equipped with an automatic by-pass which allows the oil to flow back into the clean oil compartment whenever the pressure exceeds 30 lb. For the purpose of safety there is placed in the system a duplex pump which is connected up to the compressed air line, also to the steam line, and is automatically controlled by a Foster regulator. The filter unit is made by the Richardson-Phenix Company, Milwaukee, and is capable of handling 800 gal. of oil per hr.

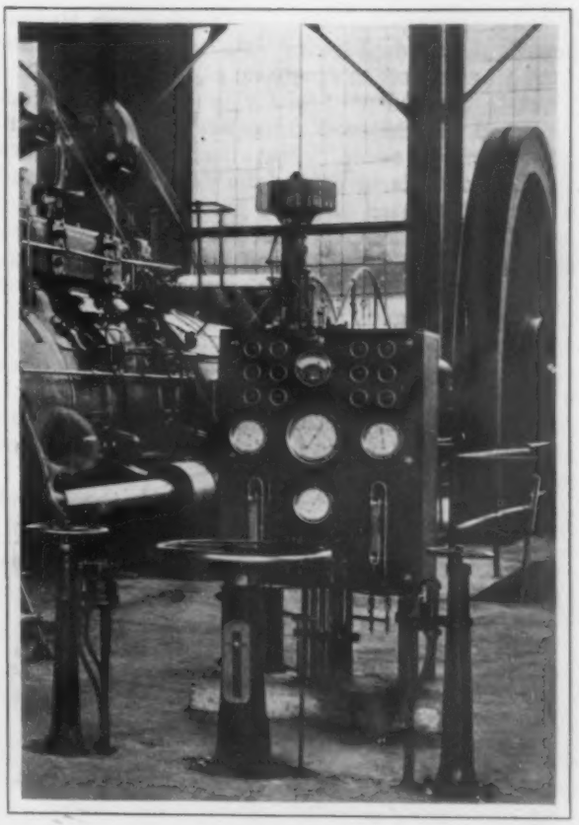
The crank pin can be supplied with oil from two independent sources. Under ordinary conditions oil is fed to the pin through the hollow shaft, and the supply coming from the gravity system is controlled by an extra large sight feed. In case of partial clogging of this regular supply, pressure from the oil pump can be turned into the pin through a large pipe, thereby flooding, cleaning and cooling it.

Each end of each cylinder is provided with three igniters of the mechanical make and break type. A simple and effective device is arranged on the end of the lay shaft for the purpose of advancing or retarding all igniters. The spark coils, as well as the tell-tale lamps and switches, are arranged on the instrument board immediately in front of the starting stand so that the operator can conveniently check the operation of the ignition system. Arrangement is made on the cylinders so that any igniter can easily be removed while the engine is in operation.

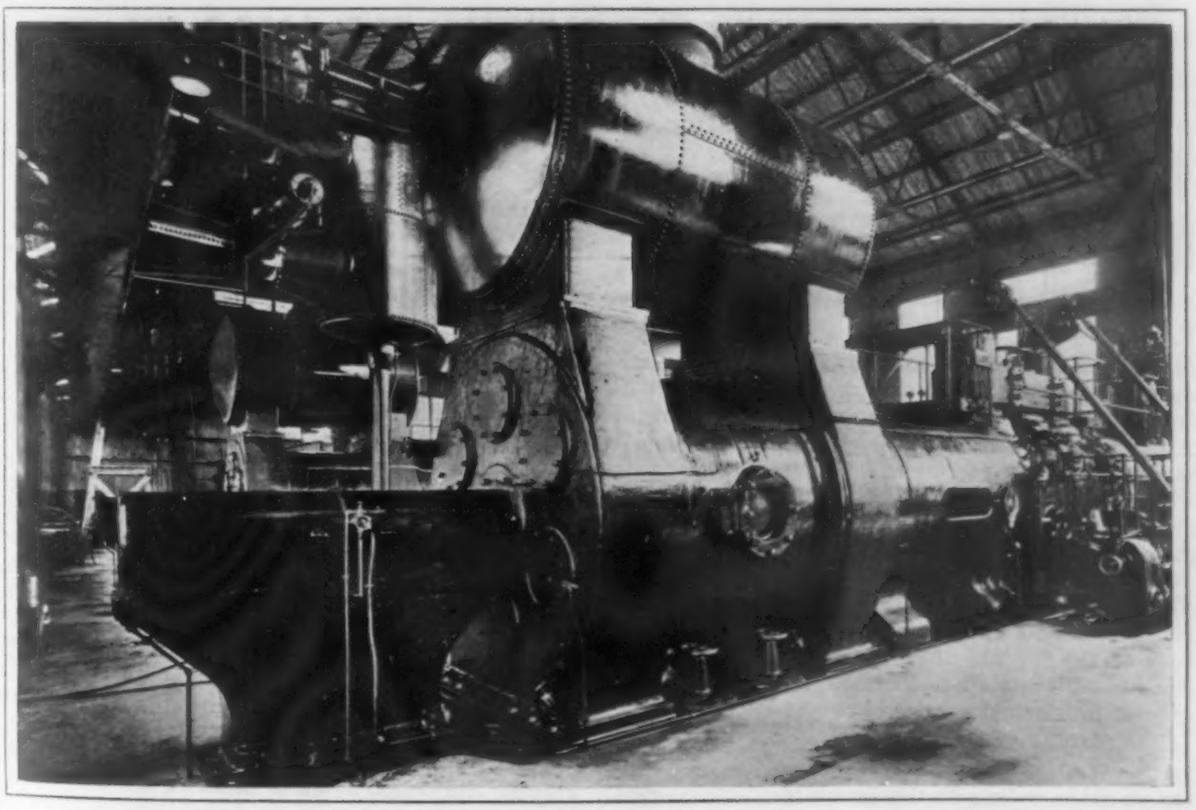
Each cylinder end contains plain butterfly valves, one for gas and one for air. The valves are located immediately in front of the main inlet valve and are free to rotate without coming into contact with any rubbing surface that might cause friction. Since the vanes of these valves are very thin, impurities in the gas do not collect and make them "sticky." Since the butterfly valves are practically balanced, the resistance to governor control is small, and the governor acts directly on the valve gear without an oil-relay.

There is a large receiver on top of each blowing cylinder. This protects the blast line from vibration. There are two receivers in series close to the engine, one receiver directly on the blowing cylinder and the other a short distance away. The last mentioned receiver acts as a distributer for the two blast lines.

To take care of the condition that the blast pressure may at times rise to 50 per cent above its normal value, the Mesta Machine Company has provided a combination of a snorting device and auxiliary clearance. In the bed plate under the blowing cylinder are two Mesta automatic plate valves which in ordinary operation of the engine are kept open by hand wheel operated screws. The hand wheels will be noticed under the blowing cylinder, as indicated in one of the illustrations. Furthermore, some of the inlet valves at each end are connected to a piston which is controlled by compressed air. Ordinarily these valves operate just like the other inlet valves, but if the small hand lever visible at the outer end of the horizontal diameter of the blowing head is turned 90 deg. the above-mentioned inlet valves are kept open. Keeping open the valve in the inlet duct allows the air to be moved in and out



The Concentration of Operating Levers and Hand Wheels



The Air End of the Blowing Engine Showing Receiver and Regulating and Control Valves

by the piston through the open inlet valves so that there is no air delivered. This device is made use of in starting or in changing stoves, etc. If the valves in the bed plate under the blowing cylinder are closed and the inlet valves are kept open, clearance volume is added. The effect of clearance, as is well known, is to reduce the delivery of air and to reduce the mean effective pressure. The reduction of mean effective pressure is made use of if the blast pressure rises beyond 22 lb. per sq. in. with poor blast furnace gas, or beyond 25 lb. per sq. in. with good blast furnace gas. Depending upon the amount of pressure rise above this critical pressure, clearance volume is added either to one or both ends of the blowing piston. The volume of air delivered is maintained by speeding up the engine. The engine is designed for a maximum speed of 85 r.p.m.

In each blast line connection from the second receiver, already mentioned, there is placed a valve operated by compressed air. These valves are controlled from the operating stand, and by throwing a small hand lever the changing from one line to another can be accomplished in a few seconds, whereas in older installations of this kind it took considerable time and manual labor to make the change.

The Pennsylvania Steel Company has installed Venturi meters both in the gas and in the blast mains so that a check can be kept on the performance of the engine. Arrangements are now being made to calibrate these Venturi meters before they are put into actual service.

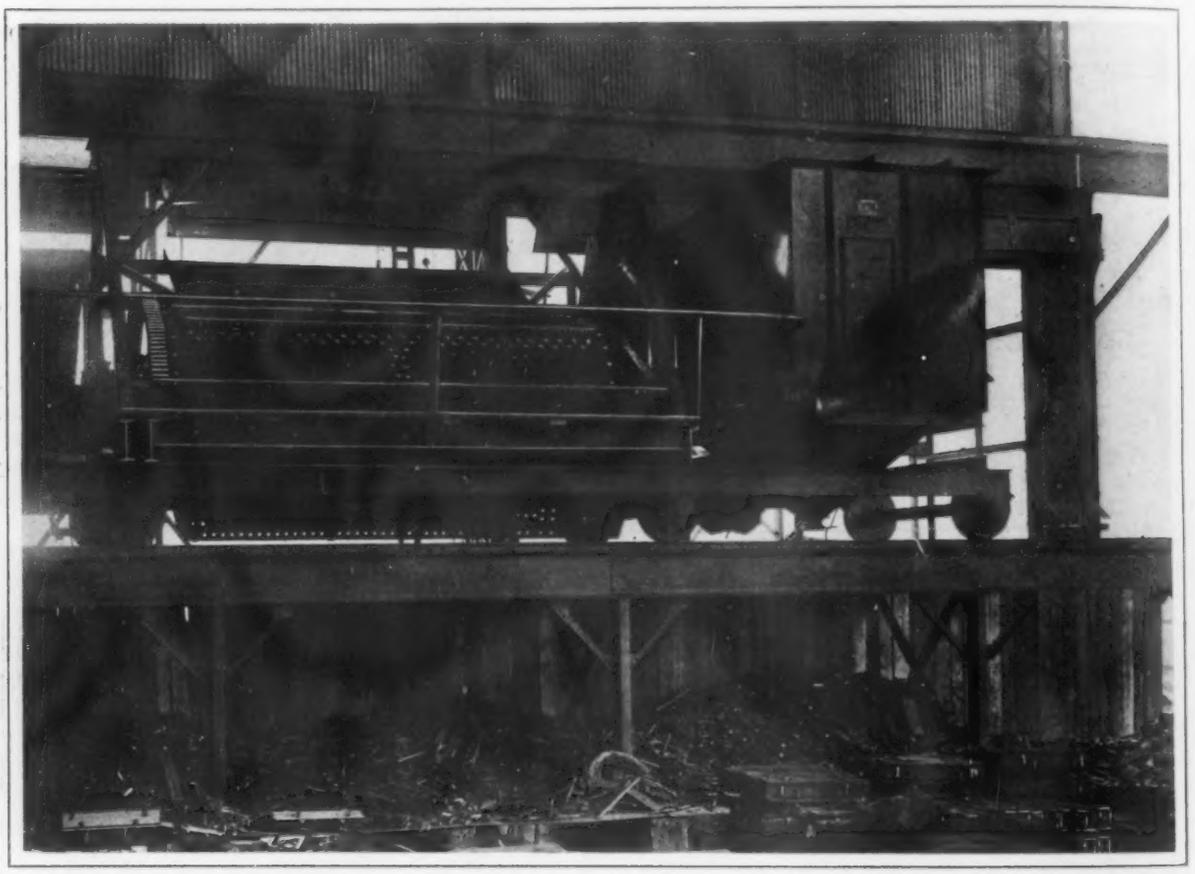
The Western Reserve Steel Company, Warren, Ohio, has placed an order with the Shaw Electric Crane Companw, Muskegon, Mich., for one 10-ton overhead crane for use over the pickling and annealing department.

A Traveling Mill for Cleaning Scrap

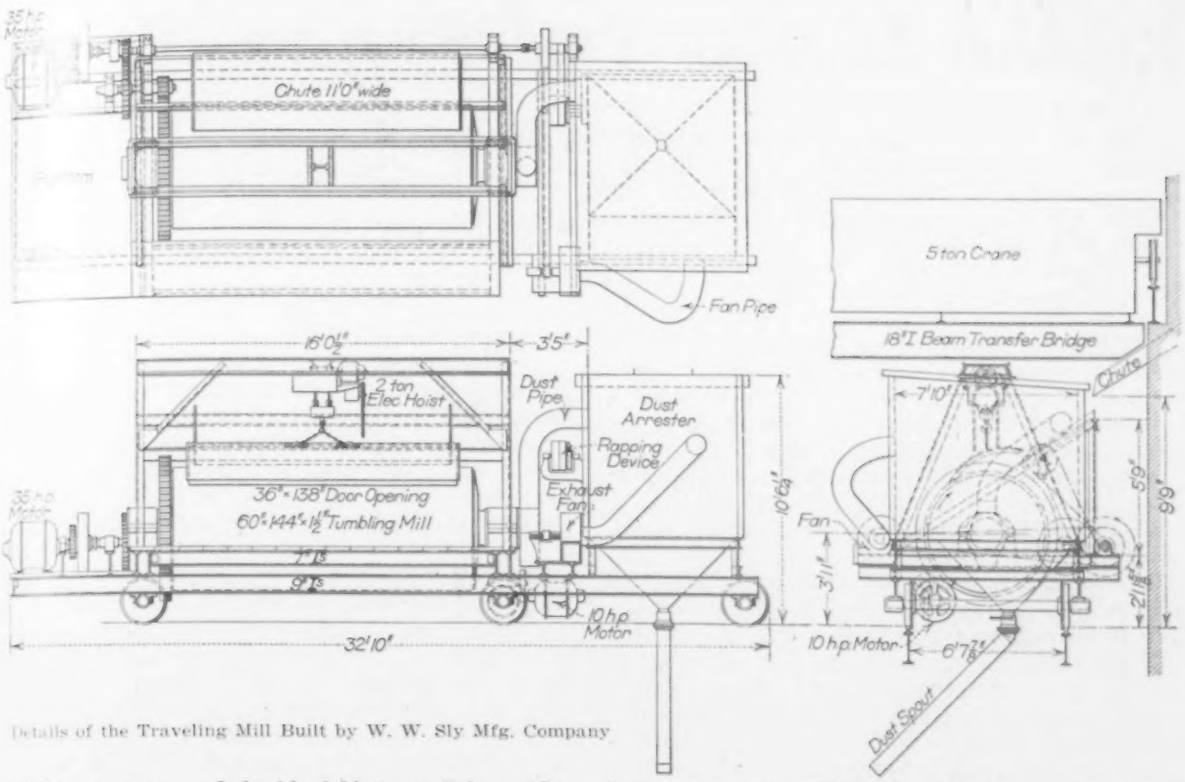
The W. W. Sly Mfg. Company, Cleveland, Ohio, has built for the St. Louis Screw Company a traveling tumbling mill for the cleaning of scrap. The general design of this mill is illustrated in the accompanying photograph and line drawings. The mill is mounted on motor driven trucks which have a horizontal travel of 40 ft. per min., thus providing for the spotting of the mill at any point along the piling bench for receiving or the delivery of scrap. The mill has capacity for cleaning 30 tons of scrap per hr. and is itself motor driven by a 35-hp. motor. It has a diameter of 5 ft. and is 12 ft. long, the shell being rolled from 1½-in. flanged steel.

The construction of this mill represents an especially careful design. The heavy steel shell is rolled to shape with the horizontal joint opposite the door. The door is then sawed out after the shell is rolled up and riveted and the piece which is removed is riveted to a ⅜-in. cover which overlaps the opening and makes a tight joint. The door is fastened with special clamps. The mill heads to which the shell is attached with tap bolts are of cast iron and the trunnions are bolted to the heads inside the mill. The head covers are made of flanged steel and protect the entire area of the head, so that no cast iron is exposed to wear. Provision is also made for a pipe connection for the introduction of hot air through one of the trunnions for the purpose of drying wet scrap, which is then more easily cleaned. Through the opposite trunnion the exhaust to the dust arrester is taken off.

The dust arrester is made of No. 16 gage steel, riveted and bolted so as to make an air and water-tight compartment. The dust arrester shell is reinforced at the lower edges by steel angles, while the



The Traveling Tumbling Mill in the Plant of the St. Louis Screw Company: Operating Platform at Left Not Shown in Photograph



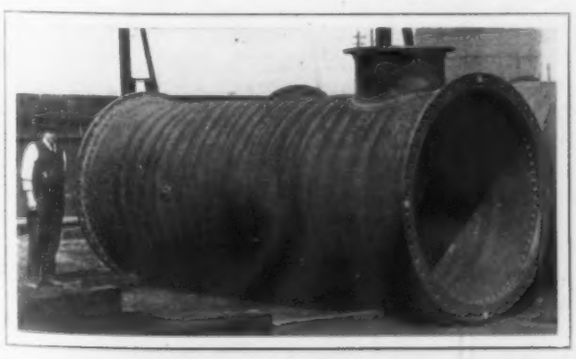
Details of the Traveling Mill Built by W. W. Sly Mfg. Company

upright seams are of double-fold type, 3 in. wide, strongly bolted together and backed with tarred paper to prevent leakage. The vacuum in the dust collector, which sets up the circulation from the tumbling mill, is obtained by a fan connected through a clutch, with the mill drive.

All of the driving gears of the mill are of semi-steel, with chilled teeth. The trunnions are fitted with roller bearings and in every respect the construction has been worked out with a view to continuous service without interruption and a low depreciation.

Corrugated Shell for Pressure Pipe

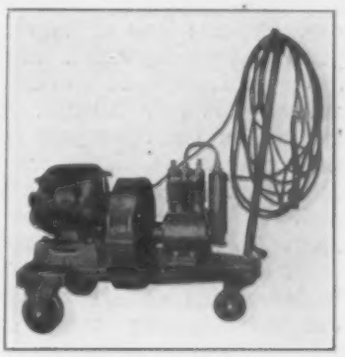
A unique adaptation of corrugated steel plate to the making of large diameter pressure pipe is illustrated in the accompanying photograph. The pipe shown was built by the American Spiral Pipe Works, Chicago, for an exhaust steam line where stiffness to afford additional strength to meet vacuum service requirements is desired. The pipe is lap-welded, 66 in. in diameter and the shell is $\frac{3}{8}$ in. thick with corrugations on 8-in. centers and about $\frac{1}{2}$ in. deep, fitted with seamless forged steel flanges. The corrugations are not sufficiently pronounced to add an appreciable friction to resist the free passage of steam, but they increase the strength of the pipe sufficiently to permit the use of a lighter shell than can be used in plain pipe for the same service. This pipe has its counterpart in the corrugated shells used for many years in internally fired boilers where the full boiler pressure is sustained from the outside.



A Large Diameter Pressure Pipe for an Exhaust Steam Line Made from a Corrugated Steel Plate to Provide the Stiffness Needed in Vacuum Service

Small Air Pump for Factory Garages

Two types of pumps for use in the garages of factories and other industrial plants employing motor trucks have been added to the line built by the Hartford Machine Screw Company, Hartford, Conn. One of the pumps, that illustrated, is driven by a ½-hp. motor and is mounted on a truck, while the other is a stationary unit of the belt-driven type for use where a prime mover of some sort and shafting form part of the equipment. Both pumps may be used for supplying air directly into the tires or in connection with a compressed air tank installation.



A Small Portable Air Pump with Motor Drive That Has Been Developed for Use in Garages Connected with Factories and Industrial Plants

The pumps do not employ piston rings, the pistons themselves being made extra long and finished by grinding and lapping to make a tight fit in the cylinder walls. A small expansion chamber is attached to the pump to clarify the air. The motor driven pump is equipped with wires to make a connection to a source of electric current, as well as air hose, pressure gage and a special nozzle for use in blowing dirt and dust out of the corners of the cars and the machinery.

The American Clay Machinery Company, Willoughby, Ohio, has taken an order for machining 20,000 high explosive shells.

Relation Between Production and Costs*

The Fallacy of All the Expense, However Large, Being Carried by the Output, However Small—New Theory of Expense Distribution

BY H. L. GANTT, NEW YORK

Few manufacturers have a cost system on which they are willing to rely under all conditions. There does not yet seem to have been devised any system of distributing that portion of the expense known variously as indirect expense, burden or overhead, in such a manner as to make us have any real confidence that it has been done properly.

There are in common use several methods of distributing this expense. One is to contribute the total indirect expense, including interest, taxes, insurance, etc., according to the direct labor. Another is to distribute a portion of this expense according to direct labor, and a portion according to machine hours. Other methods distribute a certain amount of this expense on the material used, etc. Most of these methods contemplate the distribution of all of the indirect expense of the manufacturing plant, however much it may be, on the output produced, no matter how small it is.

If the factory is running at its full, or normal, capacity, this item of indirect expense per unit of product is usually small. If the factory is running at only a fraction of its capacity, say one-half, and turning out only one-half of its normal product, there is but little change in the total amount of this indirect expense. all of which must now be distributed over half as much product as previously, each unit of product thereby being obliged to bear approximately twice as much expense as previously.

When times are good, and there is plenty of business, this method of accounting indicates that our costs are low; but when times become bad and business is slack, it indicates high costs due to the increased proportion of burden each unit has to bear. During good times, when there is a demand for all the product we can make, it is usually sold at a high price and the element of cost is not such an important factor. When business is dull, however, we cannot get such a high price for our product, and the question of how low a price we can afford to sell the product at is of vital importance. Our cost systems, as generally operated at present, show under such conditions that our costs are high and, if business is very bad, they usually show us a cost far greater than the amount we can get for the goods. In other words, our present systems of cost accounting go to pieces when they are most needed. This being the case, many of us have felt for a long time that there was something radically wrong with the present theories on the subject.

*Paper, substantially in full, read before the American Society of Mechanical Engineers, Buffalo, N. Y., June 25. The discussion of the paper is reported elsewhere in this issue.

As an illustration, I may cite a case which recently came to my attention. A man found that his cost on a certain article was 30 cents. When he found that he could buy it for 26 cents, he gave orders to stop manufacturing and to buy it, saying he did not understand how his competitor could sell at that price. He seemed to realize that there was a flaw somewhere, but he could not locate it.

A CASE OF FAULTY FIGURING

I asked him what his expense consisted of. His reply was labor 10 cents, material 8 cents and overhead 12 cents. My next question was: Are you running your factory at full capacity? and got the reply that he was running it at less than half its capacity, possibly at one-third. The next question was: What would be the overhead on this article if your factory were running full? The reply was that it would be about 5 cents; hence the cost would be only 23 cents.

> The Indirect Expense Chargeable to the Output of a Factory Bears the Same Ratio to the Indirect Expense Necessary to Run the Factory at Normal Capacity, as the Output in Question Bears to the Normal Output of the Factory

The possibility that his competitor was running his factory full suggested itself at once as an explanation.

The next question that suggested itself was how the 12 cents overhead, which was charged to this article, would be paid if the article was bought. The obvious answer was that it would have to be distributed over the product still being made, and would thereby increase its cost. In such a case it would probably be found that some other article was costing more than it could be bought for; and, if the same policy were pursued, the second article should be bought, which would cause the remaining product to bear a still higher expense rate. If this policy were carried to its logical conclusion, the manufacturer would be buying everything before long, and be obliged to give up manufacturing entirely.

The illustration which I have cited is not an isolated case, but is representative of the problems before a large class of manufacturers, who believe that *all of the expense, however large, must be carried by the output produced, however small.* In 1897 the plant of which I was superintendent was put out of business by just this kind of logic. It never started up again.

WHY COST SYSTEMS SOMETIMES FAIL

Most of the cost systems in use, and the theories on which they are based, have been devised by accountants for the benefit of financiers, whose aim has been to criticize the factory and to make it responsible for all the shortcomings of the business. In this they have succeeded admirably, largely be-

Cost Keeping Methods are Not Devised to Enable the Superintendent to Know Whether or Not He Is Doing the Work He Is Responsible for as Economically as Possible

cause the methods used are not so devised as to enable the superintendent to present his side of the case.

Our theory of cost keeping is that one of its prime functions is to enable the superintendent to know whether, or not, he is doing the work he is responsible for as economically as possible, which function is ignored in the majority of the cost systems now in general use. Many accountants, who make an attempt to show it, are so long in getting their figures in shape that they are practically worthless for the purpose intended, the possibility of using them having past.

Let us suppose that a manufacturer owns three identical plants, of an economical operating size, manufacturing the same article—one located in Albany, one in Buffalo and one in Chicago—and that they are all running at their normal capacity and managed equally well. The amount of indirect expense per unit of product would be substantially the same in each of these factories, as would be the total cost. Now suppose that business suddenly falls off to one-third of its previous amount and that the manufacturer shuts down the plants in Albany and Buffalo, and continues to run the one in Chicago exactly as it has been run before. The product from the Chicago plant would have the same cost that it previously had, but the expense of carrying two idle factories might be so great as to take all the profits out of the business; in other words, the profit made from the Chicago plant might be offset entirely by the loss made by the Albany and Buffalo plants.

If these plants, instead of being in different cities, were located in the same city, a similar condition might also exist in which the expense of the two idle plants would be such a drain on the business that they would offset the profit made in the going plant.

Instead of considering these three factories to be in different parts of one city, they might be considered as being within the same yard, which would not change the conditions. Finally, we might consider that the walls between these factories were taken down and that the three factories were turned into one plant, the output of which had been reduced to one-third of its normal volume. Arguing as before it would be proper to charge to this product only one-third of the indirect expense charged when the factory was running full.

NEW PROPOSAL FOR EXPENSE DISTRIBUTION

If the above argument is correct, we may state the following general principle: The indirect expense chargeable to the output of a factory bears the same ratio to the indirect expense necessary to run the factory at normal capacity, as the output in question bears to the normal output of the factory.

Proposed Methods of Figuring Warn Us to Do Everything Possible to Increase the Efficiency of the Plant We Have, Rather Than to Increase Its Size. The Size of a Business Is Not So Important as the Policy by Which It Is Directed

This theory of expense distribution, which was forced upon us by the abrupt change in conditions brought on by the war, explains many things which were inexplicable under the older theory, and gives the manufacturer uniform costs as long as the methods of manufacture do not change.

Under this method of distributing expense there will be a certain amount of undistributed expense remaining whenever the factory runs below its normal capacity. A careful consideration of this item will show that it is not chargeable to the product made, but is a business expense incurred on account of our maintaining a certain portion of the factory idle, and chargeable to profit and loss. Many manufacturers have made money in a small plant, then built a large plant and lost money for years afterwards, without quite understanding how it happened. This method of figuring gives a clear explanation of that fact and warns us to do everything possible to increase the efficiency of the plant we have, rather than to increase its size.

This theory seems to give a satisfactory answer to all the questions of cost that I have been able to apply it to, and during the past few months I have laid it before a great many capable business men and accountants. Some admitted that this viewpoint would produce a very radical change in their business policy, and are already preparing to carry out the new policy.

It explains clearly why some of our large combinations of manufacturing plants have not been as successful as was anticipated, and why the small, but newer plant, is able to compete successfully and make money, while the combinations are only just holding their own.

The Attempt to Make a Product Bear the Expense of Plant Not Needed for Its Production Is One of the Most Serious Defects in Our Industrial System To-day and Farther Reaching than the Differences Between Employers and Employees

The idea so prevalent a few years ago, that in the industrial world money is the most powerful factor, and that if we only had enough money, nothing else would matter very much, is beginning to lose its force, for it is becoming clear that the size of a business is not so important as the policy by which it is directed. If we base our policy on the idea that the cost of an article can only legitimately include the expense necessarily incurred either directly or indirectly in producing it, we shall find that our costs are much lower than we thought, and that we can do many things which under the old method of figuring appeared suicidal.

The view of costs so largely held, namely, that the product of a factory, however small, must bear the total expense, however large, is responsible for much of the confusion about costs and hence leads to unsound business policies.

If we accept the view that the article produced shall bear only that portion of the indirect expense needed to produce it, our costs will not only become lower, but relatively far more constant, for the most variable factor in the cost of an article under the usual system of accounting has been the "overhead," which has varied almost inversely as the amount of the product. This item becomes substantially constant if the "overhead" is figured on the normal capacity of the plant.

Of course a method of accounting does not diminish the expense, but it may show us where the expense properly belongs, and give us a more correct understanding of our business. In our illustration of the three factories, the cost in the Chicago factory remained constant, but the expense of supporting the Buffalo and Albany factories in idleness was a charge against the business, and properly chargeable to profit and loss. If we had loaded this expense on the product of the Chicago factory, the cost of the product would probably have been so great as to have prevented our selling it, and the total loss would have been greater still. When the factories are distinctly separate, few people make such a mistake, but where a single factory is three times as large as is needed for the output, the error is frequently made, with results that are just as misleading.

As a matter of fact it seems that the attempt to make a product bear the expense of plant not needed for its production is one of the most serious defects in our industrial system to-day, and farther reaching than the differences between employers and employees.

ACCOUNTANT A SERVANT OF SUPERINTENDENT

The problem that faces us is then first to find just what plant, or part of a plant, is needed to produce a given output, and to determine the "overhead" expense on operating that plant or portion of a plant. This is primarily the work of the manufacturer, or engineer, and only secondarily that of the accountant, who must, as far as costs are concerned, be the servant of the superintendent.

In the past, in almost all cost systems the amount of overhead to be charged to the product when it did not include all the overhead, was more or less a matter of judgment. According to the theory now presented, it is not a matter of judgment, but can be determined with an accuracy depending upon the knowledge the manufacturer has of the business.

Following this line of thought it should be possible for a manufacturer to calculate just what plant and equipment he ought to have, and what the staff of officers and workmen should be to turn out a given profit. If this can be correctly done, the exact cost of a product can be predicted. Such a problem cannot be solved by a cost accountant of the usual type, but is primarily a problem for an engineer, whose knowledge of materials and processes is essential for its solution.

Having made an attempt to solve a problem of this type, one of the most important functions we need a cost system to perform is to keep the superintendent continually advised as to how nearly he is realizing the ideal set, and to point out where the shortcomings are.

Many of us are accustomed to this viewpoint when we are treating individual operations singly, but few have as yet made an attempt to consider that this idea might be applied to a plant as a whole, except when the processes of manufacture are simple and the products few in number. When, however, the processes become numerous or complicated, the necessity for such a check becomes more urgent, and the cost keeper who performs this function becomes an integral part of the manufacturing system, and acts for the superintendent, as an inspector, who keeps him advised at all times of the quality of his own work.

This conception of the duties of a cost keeper does not at all interfere with his supplying the financier with the information he needs, but insures that information shall be correct, for the cost keeper is continually making a comparison for the benefit of the superintendent, of what has been done with what should have been done. Costs are valuable only as comparisons, and comparisons are of little value unless we have a standard, which it is the function of the engineer to set.

Lack of reliable cost methods has, in the past, been responsible for much of the uncertainty so prevalent in our industrial policies; but with a definite and reliable cost method, which enables us to differentiate between what is lost in manufacturing and what is lost in business, it will usually become easy to define clearly the proper business policy.

A TRAINLOAD OF CORNWALL ORE

Railroad Protest of Fifty-four Years Ago Against Ten Tons on a Car

There is some contrast between the ideas of trainloads which traffic managers have been urging upon the railroads of late, and which the railroads in many instances have been very willing to adopt, and those which prevailed in 1861 when the telegram given below was written. It will be seen that what the Harrisburg railroad man of 54 years ago complained of as an excess load for which a penalty would have to be charged would now go into two cars instead of twelve:

Philadelphia, Reading & Pottsville
TELEGRAPH,
CONNECTING WITH ALL THE NORTHERN, SOUTHERN, EASTERN & WESTERN LINES.

STATIONS AT

PORT RICHMOND, FALLS SCHUYLKILL, NORRISTOWN, PHŒNIXVILLE, POTTSTOWN, READING, ROBESONIA, LEBANON, HARRISBURG, MOHRSVILLE, PORT CLINTON, AUBURN, SCH'L HAVEN, MOUNT CARBON, PALO ALTO, POTTSVILLE, TREMONT, ASHLAND.

Office in PHILADELPHIA, R. R. Building, Fourth and Willings Alley.
" READING, R. R. R. Passenger Depot.
" POTTSVILLE, Pennsylvania Hall.
" LEBANON, Lebanon Valley R. R. Depot.
" HARRISBURG, " " "

Dated Harrisburg Apr 10th 1861

RECD Apr. 10th 1861 12 o'clock, 45 min. A.M

To R. & G. D. Coleman and.

Do not load Penna cars so heavy with ore as has been done; on last shipments, you have over 22000 on each car - the 100 tons should have been equally divided between 12 cars - You put it on 10 cars - We will be obliged to charge double rates on excess of over 18000 lbs when so heavily loaded

J. L. Wallace

R. & G. D. Coleman, the firm to whom the telegram was addressed, were then shipping Cornwall ore from the mines at Cornwall, Pa. From the same mines 55-ton loads are taken to-day. The telegram reproduced above was recently found in the records of the Cornwall Ore Bank Company by Harrison Souder, general superintendent of the company.

Temperatures in Rolling Steel Rails

This and the Heat Treatment of Steel Discussed at Last Week's Meeting at Atlantic City of the American Society for Testing Materials

While the main work of the annual meeting of the American Society for Testing Materials, held at Atlantic City, N. J., last week, was the consideration of committee reports on new and revised specifications, these were in the main passed on favorably with the recommendation that they be referred to the usual mail balloting by the membership and what few changes were suggested were of minor import and gave rise to no extended discussion. A partial list was enumerated in the last issue covering the first day's sessions, those of Tuesday, June 22. As the opportunity presents itself, space will be given in these columns to the features of these specifications, which are obtainable in printed form from the secretary, Prof. Edgar Marburg, University of Pennsylvania, Philadelphia. Also, as early as possible will be reviewed some of the unusually interesting papers, such as one on the cracking of copper alloys under certain conditions of stress and exposure, by Ernst Jonson, inspector engineer, Board of Water Supply, New York; one on the causes of defective service of battery zincs, by Robert Job, vice-president Milton Hersey Company, Ltd., Montreal, and one on a method of determining the spelter coating on wire and sheets by J. A. Aupperle, metallurgical engineer, American Rolling Mill Company, Middletown, Ohio.

Shrinkage Clause in Steel Rail Specifications

At the Wednesday morning session, June 23, the sub-committee of the committee on steel specifications covering steel rails and accessories replied to Technologic Paper No. 38 of the Bureau of Standards, which has already been reviewed in these columns. This sub-committee report, presented by E. F. Kenney, metallurgist Cambria Steel Company, chairman, is in part as follows:

In the recent paper by Dr. G. K. Burgess, J. J. Crowe, H. S. Rawdon and R. G. Waltenburg, issued by the Bureau of Standards under the title "Observations on Finishing Temperatures and Properties of Rails," the standard specifications for steel rails adopted by the American Society for Testing Materials are criticized as follows: 1. In a general condemnation of the use of shrinkage allowance as the basis of temperature determination. 2. In that the shrinkage permitted is too great.

The mill must set the saws at such a distance apart in the case of gang saws, or at such distance from the stop in the case of a single saw, that when rails are cold they will be within the close tolerances for length prescribed by the specifications. The penalty for not observing this is the milling of every rail to length, and the penalty is so severe in a modern rail mill that there is no question that the proper adjustment of the hot length will be provided. It is not possible for the mill to manipulate the hot length without the knowledge of the inspector, who can without difficulty satisfy himself that any shrinkage-allowance requirements are being observed.

The measurement of temperatures of rails by pyrometer is a much more complicated proposition. Carrying the identity of each hot rail as to its observed temperature through the mill and out to the finishing shed where it can be rejected where necessary, would be a difficult and expensive procedure. One or two men would be required to operate the pyrometer and record temperatures, and several men would probably be required to follow up those rails which showed temperatures outside of the limits permitted.

In a complex section, like a tee rail, there is a wide variation in the temperature of the various parts. If limiting temperatures were specified, and these temperatures were observed on the head or the center of the base, it is quite possible that with the section of the thin-base type, the edges of the flange might be rolled at a temperature below the recalescence. The reduction in the rail-mill passes is likely to damage high-carbon steel at this low temperature.

The shrinkage allowance necessary for rails is a function, not only of the average temperature, but also of the section. When cut by the saws the cooler base and hotter head are of the same length, but as the head has a greater range to cool through, its shrinkage would be greater and cold length less than the base. This is corrected by the cambering rolls, which stretch the head to such length as will compensate for its greater shrinkage. The shrinkage allowance in sawing is the amount of shrinkage of the portion which cools and becomes rigid first.

TESTS MADE BY MR. WICKHORST

M. H. Wickhorst reported on a series of tests made on Bessemer rails, the finishing temperatures of which measured on the heads varied from 940 to 1030 deg. C., and more recently the same investigator reported on a similar series of tests made on open-hearth rails. The rails were subjected to drop tests, bend tests, tension tests, transverse tests of base, and the structure was examined under the microscope.

On Bessemer steel rails, Mr. Wickhorst reported "that the ductility and deflection in the drop test were influenced little, if any, by the temperature." His conclusions on the open-hearth series, which were rolled at temperatures between 695 and 850 deg. C., were as follows: "The results in the drop tests, slow bending tests and transverse test of the base, were about the same for the different finishing temperatures, varied by holding the rail bar between rolls before final finishing. In the tensile tests the results were also about the same, except that the lower finishing temperatures showed a little greater elongation and reduction of area. The lower finishing temperatures also showed a somewhat finer grain structure."

We are able to submit the results of investigation of the physical properties of the rails finished at various temperatures, as determined by drop tests, ductility tests, tension tests, fatigue flexure tests, and abrasion tests. The work was done by the Illinois Steel Company, the Pennsylvania Steel Company and the Cambria Steel Company.

TESTS MADE BY ILLINOIS STEEL COMPANY

Three heats of steel were used, one being rolled in 85-lb. rails, one into 90-lb. rails and one into 100-lb. rails, all of the A. R. A. section type "A." Part of the rails were rolled at a temperature corresponding to a shrinkage of 6¾ in. for the 100-lb., 33-ft. rails, and part were rolled at a temperature corresponding to a shrinkage of 5 9/16 in. for 100-lb., 33-ft. rails. Those finished at the higher temperature are marked "hot-finish," and those at the lower temperature, "cold-fin-

ish." The finishing temperatures close to the edge of the flange varied from 880 to 905 deg. C. on the hot-finished rails, and from 740 to 760 deg. C. on the cold-finished rails. These temperatures were measured at the finishing pass in the rail mill, and are only 50 to 70 deg. C. above the critical temperature for rail steel, and were therefore as low as it was deemed advisable to go.

The results have been plotted. In general there is no marked difference between the qualities of the rails rolled at these various temperatures. The drop tests on the 85-lb. rails would indicate that the rails finished at low temperatures have slightly better physical properties, but the reverse is indicated on the 90 and 100-lb. rails. The tension tests on 85-lb. rails also show slightly better properties in the rails finished at low temperatures, but the same test on the 90 and 100-lb. rails shows decrease in both elastic limit and ultimate strength on the low-temperature rails; while the elongation and reduction of area are increased compared with the rails rolled at the higher temperature. The fatigue tests show more uniformity in the rails finished at high temperature than those finished at low temperature.

TESTS MADE BY PENNSYLVANIA STEEL COMPANY

The Pennsylvania Steel Company made tests to determine the relative resistance to abrasion of various rails under conditions approaching those existing in ordinary service. The machine used had a circular track with a revolving carriage equipped with standard wheels, with facilities for adjusting the wheel loads and the speed. The rails to be tested were laid in the track and the amount of metal worn away from the head was measured. Rails finished at temperatures of 850, 990 and 1090 deg. C. were tested in the machine at the same time, and the amount of metal worn away was practically uniform, as follows:

Finishing Temperature, Deg. Cent.	Shrinkage, In.	Amount of Wear, Per Cent
850	6.4	67
990	7.3	64
1090	7.8	66

TESTS MADE BY CAMBRIA STEEL COMPANY

Tests were made on 100 and 125-lb. Pennsylvania Railroad rails, which were finished at various temperatures ranging between 805 and 885 deg. C. The number of blows required to break the rail and the total percentage of elongation measured in the base, which the rail gave before fracture under the drop test, were used to indicate the comparative brittleness and ductility. The results indicate very little effect of the different finishing temperatures within the range of the experiment.

RESULTS OF SERVICE IN TRACK

The behavior in track under service conditions is, of course, the ultimate test as to the quality of rails, but there appears to be very little data available to connect the service given by rails with their finishing temperatures. As general information the committee submitted statements by J. B. Young, chemist of the Philadelphia & Reading Railway Company, and J. Craig Crawford, assistant engineer of the Pennsylvania Railroad Company.

In summarizing, the committee report, which is obtainable in printed form, affirms that there is lacking anything which points to such decided differences in the quality of rails rolled at varying temperatures, as theoretical considerations have led some of us to expect. The differences are so slight, it holds, that it seems hardly justifiable to go to any great expense in determining finishing temperatures any more accurately than is possible with the shrinkage clause, which on account of its easy application is by far the most convenient means of checking the finishing temperature.

Discussion by Dr. Burgess

Dr. George K. Burgess, Bureau of Standards, discussed the report in part as follows:

The report of the committee contains no specific recommendations regarding the "shrinkage clause" in the rail specifications of the society, from which it seems fair to conclude the committee considers this clause has some significance in its present form. It is respectfully submitted as axiomatic that either the shrinkage clause means something or it means nothing, but it cannot mean both. It is also evident that in the rail mill a suitable shrinkage allowance must be made or the cold rails will not be of the required length. There is, however, a fundamental difference in principle between what is the mill's convenience in manufacturing and a supposedly upper limit of finishing temperatures which the specifications say the mill must not exceed. The writer would like to ask the committee if it has any information of the percentage of rejections due to hot-finishing under the shrinkage clause—not rejections because of incorrect cold length as such, but on account of temperature of rolling?

UNDUE MILL CONVENIENCE SUGGESTED

The shrinkage clause permits a maximum shrinkage of 6¾ in. in 33 ft. for a 100-lb. rail, but only 6 7/16 in. for a 75-lb. rail, corresponding to a difference in finishing temperatures of some 60 deg. Fahr. Why this discrimination in favor of the heavy section? Is the answer to be sought in the fact that the lighter section has different and less desirable properties when rolled 60 deg. hotter than is allowed by the specifications, or was this allowable "1/16 in. for each increase of 5 lb. in the weight of the section" put into the specifications because, in the mill, starting with ingots (or blooms) at the same temperature the rails of heavy section will naturally be finished hotter than the lighter for a give mill train and speed? or, in other words, does the 1/16 in. per 5 lb. represent a manufacturing convenience or a necessary limitation on the operation in view of the properties of the finished rail? If the former, it is not needed in the specifications; if the latter, the report of the committee does not give sufficient evidence on the desirability of having a higher upper limit for finishing heavy sections.

As to the actual maximum finishing temperatures permitted by the shrinkage clause, according to the Bureau of Standards' measurements, they amount to 1120 deg. C. (2045 deg. Fahr.) for 100-lb. Bessemer rails, or almost exactly the usual temperature of the ingot in the blooming mill; althougn the committee, as evidenced by the last sentence of this report, is content with this shrinkage allowance. The question may also be asked, in view of the undoubted fact that rails finished too cold may be dangerous, why is there not a lower shrinkage limit as well as an upper?

The commmittee advances arguments for preferring the shrinkage method of measuring finishing temperatures to the pyrometric method described in Technologic Paper No. 38. The authors of that paper when recommending the latter considered all the points now raised by the committee, several of which apply with equal force to both methods. It is of course evident, whether it is a preferred method or not, that when correctly used the shrinkage of a rail may be used as a measure of its temperature at the hot saw. The writer considers, however, that he and his associates have proved the present maximum shrinkage allowance is of no practical significance and is moreover misleading, since it permits (according to our measurements) finishing rails at a temperature some 800 deg. Fahr. above the critical temperature (1240 deg. Fahr.) of rail steel, whereas, it is evident from the discussion attending the establishment of the shrinkage clause, that the intention was to limit finishing to slightly above this recalescence point.

PYROMETRIC METHOD CHAMPIONED

The committee objects that the optical pyrometric method used in these measurements does not give the temperature of the rail and that the shrinkage is controlled by the flange. There were, however, temperature measurements made for this committee's report, but there does not appear to be included any statement of the pyrometer used or whether the temperature results from the several mills are really comparable. There also appear to be several inconsistencies in the report in respect to finishing temperatures and shrinkage. In the writer's opinion, this flange effect is of

little or no consequence, at least with the more recently developed American sections, and it is always to be borne in mind that at the recalescence point any ordinary rail section will take up a practically constant temperature throughout, this phenomenon acting therefore to diminish the flange effect; and furthermore, this recalescence or equalizing point being below the temperature of the rail at the hot saw the method of measuring temperatures there bears no necessary relation to the history of the rail below the critical range.

The writer is surprised to note the opinion of the committee on which there are several mill representatives, that if rail finishing temperatures were measured by a pyrometer this would be a costly operation and it would be difficult to locate and sort the cold rails in terms of their finishing temperatures. Is there not room on the 33 ft. of the rail web to stamp the ingot number which, with the heat number and rail letter now stamped, will absolutely identify every rail? The pyrometric observer—who may be a manual training graduate at $400 or $500 a year with his pyrometer kit costing $100 to $250—will have no difficulty in following the heat numbers from his station. If, therefore, as the committee appears to believe, it is, nevertheless of some importance to control finishing temperature, this can be done accurately, cheaply, simultaneously with the rolling, by the pyrometer method described.

COMMITTEE EVIDENCE DEEMED NOT CONCLUSIVE

It does not seem to the writer that the evidence offered by the committee on the relation of finishing temperatures to properties and service of rails, although undoubtedly of value, is very conclusive one way or the other for several reasons. In some of the experiments the temperature range is too small, in all of them the pyrometric method is but vaguely described or only hinted at, the various sets of data relate usually to rails of different or unstated composition or method of manufacturing and of various weights and sections, thus introducing uncertain and numerous variables which will influence the physical properties measured, but above all there have been too few observations taken to reach definite conclusions.

The problem, apparently can only be solved by comparing the properties and behavior in like service of several thousand tons of rails which are as identically similar as may be in all respects, except that one-half say, should be rolled and finished hot and the other half cold, or better, there should be three grades, the temperature of each of which should be controlled exactly by modern pyrometric methods. The writer, representing the Bureau of Standards, would be pleased to have the opportunity to co-operate with the committee in a practical program of this kind which would not be difficult of execution and which might solve a problem which has perplexed those interested for the past fifteen years or more.

ABANDON SHRINKAGE CLAUSE

J. J. Crowe, Bureau of Standards, in a short written discussion, agrees that the committee has proved that the finishing temperature within the limits of their experiments does not affect the properties of rails. Their results show that rails having a much larger shrinkage than that permitted by the specifications of the American Society for Testing Materials are as good as those finished with a shrinkage coming within the specifications, then why not strike out the shrinkage clause, he asks, and let the mills finish at whatever temperature suits them best until such time as it is conclusively proved that there is a best finishing temperature or best finishing temperature interval and then measure the finishing temperature by the shrinkage or any other convenient method which will give satisfactory results.

ACTION OF STEEL SPECIFICATION COMMITTEE

In a brief reply Mr. Kenney said the shrinkage clause was a heritage of the times when cold working was thought to be the better; that the shrinkage clause could not in justice be thrown out nor was there justification for making it unnecessarily severe; that a middle course was the one to follow. He took issue with Dr. Burgess that there was an equalization of temperature in the rail section; there was a stretch of the head in the cambering rolls to secure equal length with the base, indicating greater shrinkage in the head than in the base.

C. D. Young, engineer of tests, Pennsylvania Railroad, as chairman of the committee of steel specifications, said that by a ruling of the committee it would give consideration to an adequate reply to the discussion and would give consideration to the offer of Dr. Burgess of governmental co-operation through the Bureau of Standards.

Heat Treatment of Steel

The increasingly important subject of the heat treatment of steels was given an important place on the program of the meeting. One whole session, the fifth, on Wednesday evening, was devoted exclusively to the consideration of five important papers, treating various phases of this matter. Each paper in one way or another emphasized the extent to which the pyrometer, the microscope, the dynamic machine and hardness testing apparatus are being used to study the benefit resulting from proper and improper heat-treating methods. Much of the data presented offers an important contribution to the advancement of the science.

With A. A. Stevenson, vice-president of the Society in the chair, the meeting was opened with a report of a meeting of the outgoing and incoming executive committee, held that day, relative to the financial status referred to in one of the early sessions as reported in THE IRON AGE, June 24. The committee suggested that the dues for members be raised from $10 to $15 and for junior members from $5 to $7.50 with no change in the age limit and that the fee for members in perpetuity be raised from $200 to $300. With no opposition the meeting voted the acceptance of the suggestion as an adoption, subject to ratification by letter ballot, to take effect Jan. 1, 1916.

J. A. Capp, chief of the testing laboratory, General Electric Company, Schenectady, N. Y., succeeded Mr. Stevenson in the chair and called on H. V. Wille, assistant to superintendent, Baldwin Locomotive Works, Philadelphia, to present his paper on "Internal Stresses Developed by Different Quenching Mediums and Their Effects." In substance Mr. Wille stated that:

STRESSES CAUSED BY QUENCHING MEDIUMS

There are no data available on the internal stresses resulting from quenching in different mediums and under different conditions. These stresses are determined in different portions of a cylinder about 9½ in. in diameter, quenched in water, light tempering oil, heavy tempering oil, fish oil and cottonseed oil. A slow and mild water quench results in a fiber stress of 45,000 lb. per sq. in.; light tempering oil, about 35,000 lb.; heavy tempering oil, about 24,000 lb., and fish oil, about 30,000 lb. per sq. in. The tensile properties of rapidly cooled steel are superior to those cooled at a slower rate. An extremely high rate of cooling is shown to develop internal cracks in a forging of carbon steel but also a very high elastic limit, elongation and reduction of area.

Mr. Wille stated that the results of his experiments showed that metallurgists are confronted with the alternative of being satisfied with conservative physical properties in quenched-and-tempered material or of accepting the danger of an occasional failure from the development of internal fracture. The effect of the initial temperature of the quenching medium on tensile properties is shown to be of no serious moment, but the internal stresses are affected thereby.

K. W. Zimmerschied, metallurgical engineer, General Motors Company, Detroit, Mich., in discussing the

paper, stated that the fact that the volume of a piece of steel is reduced by quenching is illustrated by repeatedly quenching a cylindrical piece of seel; it swells in the middle and becomes shorter, tending to assume a spherical shape. He also called attention to the fact that the efficiency of the quenching medium is not dependent altogether on the temperature; water should be well below the boiling point, in fact, relatively cool, though results can be obtained in almost boiling water. With a certain hardness also the viscosity of the oil must be around 100 to obtain the best results.

R. R. Abbott, metallurgical engineer, Peerless Motor Car Company, Cleveland, Ohio, remarked that, in quenching, the specific gravity of a steel did not change. S. V. Hunnings, chemist and engineer of tests, American Locomotive Company, Schenectady, N. Y., added that, in quenching shrapnel, his company had found that change in volume was greater in water than in oil, necessitating the exclusive use of oil.

RELATION OF HARDNESS AND TENSILE STRENGTH

Robert R. Abbott was next called upon to present his paper on "The Relation Between Maximum Strength, Brinell Hardness and Scleroscope Hardness on Treated and Untreated Alloy and Plain Steels." The author presented a terse abstract, saying in part that the investigation was carried out upon 300 types of steel, each of which was heat treated in various ways. For this paper the results obtained on carbon, nickel, chrome-vanadium, high-chrome-nickel and low-chrome-nickel steels only are considered; they comprise 3932 tests. Eighteen equations have been determined connecting the three quantities, maximum strength, Brinell and scleroscope hardness for the five different types of steel and also for all steels considered together. Comparisons were made between annealed and heat-treated steels, and also between low and high-carbon steels, heat treated to show the same maximum strength. From a consideration of the results, said Mr. Abbott, it is evident that within reasonable limits they all lie approximately along a straight line or, expressed mathematically, the relations existing between Brinell and maximum, scleroscope and maximum, and Brinell and scleroscope, are straight-line functions of each other.

K. W. Zimmerschied testified to his appreciation of the fact that Mr. Abbott's extended experiments had clinched the statement that Brinell and scleroscope hardness are functions of heat treatment and not of physical properties or chemical analysis. H. V. Wille said that Mr. Abbott's results were confirmed by tests of his own on full-sized specimens of tires.

VARYING TEMPERATURES IN HEAT-TREATING FURNACES

An important contribution to the varying temperatures existing in a heat-treating furnace and in the steel itself was offered by M. E. Leeds, president of the Leeds & Northrup Company, Philadelphia, Pa. Mr. Leeds, in offering an abstract, said that steel specimens ranging in size from 12 in. round to 2 in. round were brought to four furnace temperatures, 1000, 1200, 1400 and 1600 deg. Fahr. Continuous records were kept showing the rates of heating the various specimens and the relation in temperature between the furnace gases, the surface of the specimen and various points in its interior. It was found that the specimens assumed the furnace temperature in less time as the temperatures increased (except where the furnace temperature was slightly above the transformation point); that the temperatures throughout the interior of the specimens equalized themselves rapidly; that a contact thermocouple may be used to show when the specimen has reached the furnace temperature throughout its mass and that a contact couple may be used to show when the specimen passes through its transformation point.

Mr. Leeds added that this method of determining the time of transformation of a piece of steel has been used under his observation for hardening a large number of punches and dies as well as other small pieces and has resulted in exceptional uniformity and high quality of product. The pieces have not only come out properly hard, but have also been to a very unusual degree free from deformation and cracks. This method does away with the prior determination of the critical point on a small sample and also entirely does away with the necessity of a painstaking calibration of the apparatus.

G. K. Burgess, Bureau of Standards, Washington, D. C., in discussing the paper, emphasized the importance of this contribution to the knowledge of heat treatment in that it can establish the interrelation between the temperature of a furnace, the time to heat and the distribution of the temperature. He thought the method could hardly be improved upon and that it was a testimonial to the co-operative work possible between the technical and instrument experts.

"The Charpy Impact Test on Heat-Treated Steels" by J. J. Thomas, captain, U. S. Army, Watertown Arsenal, Watertown, Mass., was presented by title only, while G. K. Burgess, in the absence of J. G. Ayers, Jr., offered an abstract of the paper "Micrographic Determination of Surface Decarburization in Heat-Treated Steel," a portion of which is published in this issue of THE IRON AGE.

The Pennsylvania's New Laboratory

At the sixth general session on Thursday morning, devoted to testing apparatus, the interesting feature was the presentation by C. D. Young, engineer of tests of the Pennsylvania Railroad, of a comprehensive paper describing the large new physical and chemical laboratory of that railroad at Altoona, Pa., costing $275,000. Many slides showing the various laboratories and testing machines were thrown on the screen. The scope of the work done by the various testing departments of this large railroad was represented by the statement that the cost of the materials covered by the inspection and tests and entering into the construction of the railroad rolling stock and track in 1913 amounted to $82,119,480, while the cost of operating the test department and chemical laboratory for the same year was $534,060. Using these figures for an approximation, Mr. Young stated that it was interesting to observe that the total cost of operating the departments, including all additional work and instruction, is about 0.6 per cent of the cost. In 1913 there were 61,148 separate reports of material tests issued by the test department and 138,896 tests made in the physical laboratory. In the chemical laboratory in 1913 a total of 57,309 samples were analyzed, involving about 286,545 determinations.

An important addition to this railroad's testing equipment was called attention to—the laboratory car to be moved to that point where steel rails are to be inspected in process of manufacture. The object is to make chemical analyses of the finished rails at the mills by a force of chemists under the chief chemist so as to avoid delay. The car is equipped with furnaces for combustion and all other necessary apparatus.

Failure Under Repeated Stress

A highly important paper, "The Failure of Materials Under Repeated Stress," the superiority of which was later earnestly characterized by Prof. Edgar Marburg and others, was presented by one of the authors, Prof. F. H. Moore of the University of Illinois, Urbana, Ill., the co-author being F. B. Seeley. A summary of the paper states that nearly all our ideas of the action of materials under stress are derived from considerations of static action. The action of materials under repeated stress differs from static action in important respects. Under stresses slightly lower than the elastic limit, as ordinarily determined, materials failed under oft-repeated stress, and the relation of stress at failure to the number of repetitions may be expressed by an exponential formula, as shown by Basquin and others.

The paper gives a proposed explanation of this formula, based on the structural damage done to material by inelastic action during the application and removal of load. For still lower stresses no positive evidence of a fixed endurance limit has been found for commercial materials, and various methods used for

location such a supposed limit give varying results from the same test data. A modification of the exponential formula is proposed for low stresses. Tentative values of constants for the proposed formulas are given in the paper, and also some general discussion on action under repeated stress. The authors believe that a formula which assumes that the same distinctive action which occurs under high stresses will continue to act with diminished intensity under low stresses has some distinct evidence in its favor, and is a safer guide for the designer than is a fixed endurance limit below which destructive action is assumed to cease.

The paper, "A Universal Strainometer of Simple Design," in the absence of the author, S. H. Graf, assistant professor of experimental engineering, State Agricultural College, Corvallis, Ore., was presented by title. It was a description of a form of extension and compression instrument possessing the following advantages:

Applicability to a wide range of specimen sizes either in tension or compression.
Ease of use with a satisfactory degree of accuracy.
Simple construction and low cost.

The device is claimed to combine in one instrument all the requirements usually met less satisfactorily by several extensometers and compressometers.

Preservative Coatings for Steel

The question of preservative coatings was assigned to the ninth session on Friday afternoon, when committee D-1, On Preservative Coatings for Structural Materials, presented its annual report through the chairman, P. H. Walker, chemist, Bureau of Standards, Washington, with G. W. Thompson, chemist National Lead Company, Brooklyn, N. Y., in the chair. Mr. Walker announced that out of the 81 members of the committee 48 votes on letter ballot were cast on the adoption of the general report, 44 voting in favor and none against. Various new specifications were adopted subject to letter ballot.

The report of sub-committee II, W. A. Aiken, chairman, on the inspection of the Havre de Grace bridge, was as follows:

In accordance with a resolution to discontinue the inspection of the Havre de Grace bridge, one complete set of these plate panels, 57 in all—three for each of the 19 paints, one each at the several spreading rates of 600 sq. ft., 900 sq. ft. and 1200 sq. ft. per gallon of paint—were removed from the bridge site and delivered to the U. S. Bureau of Standards and one complete set to the Institute of Industrial Research at Washington, D. C. The remaining panel plates, 38 in all—2 for each of the 19 paints, one each at the two spreading rates of 600 sq. ft. and 1200 sq. ft. per gallon of paint—were delivered to the laboratory of the National Lead Company, 129 York Street, Brooklyn, N. Y., in care of Mr. G. W. Thompson, Secretary of Committee D-1, 19 plates—one for each of the paints at the spreading rate of 900 sq. ft. per gallon of paint—having been utilized by the committee several years ago, as reported at the time, in an investigation of the condition of the metal after removal of the paints on these particular plates. These plates are in storage and cared for at the laboratory of the National Lead Company.

An extended and elaborately printed report of the special sub-committee on paints used in the Havre de Grace bridge tests showed that of the 19 original paints, paint No. 11 had revealed itself as excellent from the date of application to the end of the test, 7½ years. The committee's description of this paint was as follows:

The first and second coats, red lead in linseed oil. The third coat, red lead and a very small amount of carbon pigment in linseed oil. The red lead used showed, on analysis, 95.9 per cent true red lead, Pb_3O_4. Three coats were applied. (The manufacturer of this paint offered no change in this description.)

Paint No. 10 ranked second, being excellent from the date of application for 5½ years, being good thereafter to the end of the test, 2 years. The committee's description of this paint was as follows:

The first and second coats, red lead and linseed oil. The third coat, red lead and a small amount of carbon pigments in linseed oil. The red lead used, on analysis, showed 88.5 per cent. true red lead, Pb_3O_4. Three coats were applied.

An important statement of this committee's final report is as follows:

It must be understood that the committee fully recognized, as soon as the manufacturers refused the fullest information regarding their paint products, that a considerable part of the anticipated value of these tests would not be realized.

EXTENSIVE CORROSION TESTS

At the conclusion of the session devoted to testing apparatus Committee A-5 announced the inauguration of a corrosion test of ferrous metals, on a large scale, selected from various manufacturers of open-hearth, Bessemer and basic steel sheets, pure iron and puddled sheets, coated and uncoated, the test locations to be at the sea coast, at an inland industrial site, and at some country site. The estimated cost is placed at $3500, which has been contributed by manufacturers.

American Institute of Metals

The provisional programme of the annual meeting of the American Institute of Metals, to be held at Atlantic City, N. J., September 28 to October 1, has been received from Secretary W. M. Corse, 106 Morris avenue, Buffalo, N. Y. The list of authors and papers is given below. The headquarters will be at the Hotel Traymore, and at the same time will occur the annual meeting of the American Foundrymen's Association and the exhibit of the Foundry and Machine Exhibition Company. The proposed changes in the by-laws, raising the dues from $5 to $10, and creating a corporation membership, have been adopted. Candidates for membership admitted prior to July 1 will pay the present rate of dues. The provisional programme follows:

D. H. Newland, assistant state geologist, New York, "Albany Sand."

A. D. Flinn, Board of Water Supply, New York, "Experience with Brass in Civil Engineering Work."

C. P. Karr, Bureau of Standards, "Molding Sand."

Charles Pack, Doehler Die Casting Company, Brooklyn, N. Y., "Aluminum Die Casting Work."

Dr. Burgess and Dr. Merica, Bureau of Standards, Washington, D. C., "Cracking of Wrought Brass from Overstrain."

William W. Clark, Seymour Mfg. Company, "Manufacture and Use of Alumino-Vanadium."

C. V. Powell, British Aluminum Company, Toronto, Ont., "Some Developments in Aluminum."

Russell R. Clarke, Pennsylvania Lines West, "The Advantage of a Standard Railroad Bearing Alloy (The Journal Bearing Shell, not the Lining)."

Dr. Weintraub, General Electric Company, "Silicon Resistance Furnaces for Melting Brass."

G. H. Clamer, The Ajax Metal Company, "Effect of Zinc on Copper, Tin and Lead Alloys."

W. M. Corse, The Titanium Alloy Mfg. Company, "Copper-Aluminum Alloys."

Jesse L. Jones, Westinghouse Electric & Mfg. Company, "Forging Manganese Bronze."

S. L. Hoyt, University of Minnesota, "Amorphous State of Metals."

S. W. Parr, University of Illinois, "Method of Analysis for Complex Alloys," and "Development of Acid Resistance Alloys."

Dr. Rawdon, Bureau of Standards, Washington, "Metallographical Examination of 88-10-2 Alloy."

F. A. J. FitzGerald, FitzGerald Laboratories, "Electric Furnaces for Brass Melting."

H. T. Kalmus, Kalmus, Comstock & Westcott, Inc., "Cobalt in Non-Ferrous Metals."

Dr. Samuel Trood, U. S. Sherardizing Company, "The Electric Furnace for Sherardizing."

Thomas F. Wettstein, United Lead Company, "The Effect of the Present European War on the Metal Industries."

Elwood Haynes, Haynes Stellite Works, "Stellite."

Prof. D. J. Demarest, Ohio State University, "Analysis of Babbitt Metals."

The Buckingham Steel Company is moving its offices from 25 West Forty-second Street, New York, to its new plant at 5610-5620 Second Avenue, Brooklyn, where the entire business will be concentrated. The company reports that it is very busy in structural steel fabrication.

Mechanical Engineer and Cost Accountant

American Society of Mechanical Engineers Discusses the Relation of Production to Costs—Details of Spring Meeting at Buffalo, June 22-25

The relation between production and costs, the heat treatment of alloy steel and the transmission of power by leather belts were the three topics which attracted the greatest amount of attention at the spring meeting of the American Society of Mechanical Engineers at Buffalo, June 22 to 25. What promised at first to be a rather tame meeting became before its close one of absorbing interest, and facts and ideas were brought out in the discussions which, when more fully developed, will prove of extreme value to the engineering profession and the manufacturing world.

The Relation between Production and Costs

The subject which easily held foremost place in the mind of the convention was that of cost accounting, as exemplified by Henry L. Gantt's paper under the above title, and which presented some new and, from the standpoint of the financier and cost accountant, radical ideas. The aim of the paper was to make the financier and the cost accountant subordinate in the manufacturing world to the engineer, and if the comments which the paper evoked are any criterion, the engineer is to-day preparing to take his rightful place and assume the credit for, as he now assumes the burden of, making the industries of the country successful. Mr. Gantt's paper is reproduced elsewhere in this issue.

The discussions offered were so voluminous that it was impossible to present more than a fraction of the written ones. In the main, they were of a highly commendatory character, and some elaborated on Mr. Gantt's ideas. Carl G. Barth described what he termed a "limit cost." In dull times it is not a question of how much money can be made by taking orders, but how to manage to hold the organization together and at the same time lose as little money as possible. Fixed charges go on whether or not the organization disbands. The limit cost leaves out of consideration all fixed charges and also such overhead charges which, while not fixed, become so for the time being, because it is proposed not to disrupt the organization. The overhead charges to be added to material and labor are such as actually will be incurred by the undertaking of the work under consideration. If this limit cost is less than the market value of the article, it will be correct to manufacture it; if not, it should be purchased.

Keppele Hall cited the instance of an electric light company which, according to the cost department, took a contract for electric current below cost, as an example of the error of making the product carry all the overhead. The price offered for current by a large consumer, at a time when the load was light, was very low and below the cost of production, if the overhead was prorated to the output. Actually, the additional load imposed on the plant only the cost of the coal to generate the power and the cost of removing the ashes. While the cost department showed, after the contract was accepted, that the current was being sold below cost, as a matter of fact this contract proved to be a handsome dividend payer. Mr. Hall offered as a possible objection to Mr. Gantt's plan the fact that it does not hold the superintendent responsible for items of expense which are under his control in slack times. The division of the indirect expense, holding the product for such portion of it as the superintendent can control, was given as a possible solution of this problem. Stress was laid on the fact that as the product eventually has to stand all the expense, direct and indirect, the relation between cost and selling price must never be lost sight of, for there is a limit which cannot be passed in selling articles below cost.

An arrangement suggested for proportioning indirect costs is to have a machine or work place rate fixed to cover all indirect expense under normal conditions. Each job is charged with material, labor and machine- or work-place hours, the balance of the indirect expense not so absorbed being placed in an "under-absorption account." This account increases in dull times and decreases in busy times. The cost of the product is determined by the sum of material, labor and work-place hours, and except for variations in the efficiency of the worker this method holds the costs practically constant.

R. E. Flanders, manager Jones & Lamson Machine Company, Springfield, Vt., compared what he termed the "average rate" method of apportioning costs with what he called Mr. Gantt's "proportional rate" method. Under his plan all items which go to make up shop overhead are charged to an overhead account, which is credited with all sums apportioned as overhead to the work in process. The overhead rate is set to agree with average business conditions over a long period, and this rate can be charged from time to time to meet varying conditions. The two plans have many advantages in common. The principal difference between them is that with the average rate the burden of carrying idle equipment and organization through dull times is distributed over the cost of work in good times, while the proportional rate charges it to profit and loss.

STANDARD COST ACCOUNTING FOR INDUSTRIAL ESTABLISHMENTS

Charles Piez, president Link-Belt Company, Chicago, sent in a written discussion in which he told of the cost accounting methods of that company. He holds that costs are, at best, a more or less accurate approximation. With the fluctuations which occur in business, a determination must be made of what normal costs, due to normal factory operation, are. In the ordinary run of manufacturing factory operation will range from 50 per cent or less of normal capacity, in dull times such as we have had recently, to 150 per cent of capacity in boom times. This statement applies not only to the factory as a whole, but to the several departments of a factory.

The Link-Belt Company has assumed normal conditions to be those which call for the full complement of men to work 2500 hr. per year. This means

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an activity of 90 per cent of full time operation on the basis of a 54-hr. week. The figure of 90 per cent is taken as a standard, because a manufacturer must have sufficient reserve capacity to take care of urgent needs of his customers upon short notice. The average factory expenses are distributed on a payroll representing the 90 per cent activity of the plant, and average or standard department expense and general expense factors are distributed on the output which this activity represents. The costs, being based on averages, are therefore independent of fluctuations in business. At the end of each month the standard or average factors for each department are compared with the actual figures, and the total of all expense is compared with the total obtained by distributing the expense by the standard rates. In times of depression the standard rates fail to distribute the total expense, and the debit balance goes to reduce profits. In times of prosperity there is a credit balance over the standard rates which will increase the profits. Sheets are prepared each month, giving a comparison of the standard expense rates and the actual rates. These exhibit to the management every month the condition of the business and permit corrections to be made in the standard rates when such are necessary. Mr. Piez closed with a plea that the society should appoint a committee to investigate the entire subject of cost accounting and to develop a standard method for industrial establishments.

W. N. Polakov, superintendent of power, New York, New Haven & Hartford Railroad, New Haven, called attention to the fact that a great deal of the trouble in obtaining information of any value from cost systems is due to the using of data which show what conditions have been in the past instead of what they are at the present time, or what they will be in the future. He gave as an instance a company which generated a large quantity of electric current in a power station on which there was an overhead charge of about $200,000 per annum. When the company found that it needed additional power, a proposition was made by an electric company that the company purchase its electricity, instead of enlarging its station, offering a rate of 0.83 cent per kilowatt-hour. A calculation showed that the cost of electricity generated in the private station was apparently 0.88 cent per kilowatt-hour, indicating a saving by purchasing at least the extra current of about $30,000. Mr. Polakov, however, showed that the cost of current as made by the private station was figured with an overhead charge based on previous conditions, and that instead of it costing about 0.60 cent per kilowatt-hour to manufacture, plus an overhead of 0.28 cent per kilowatt-hour, the conditions as they then existed or would exist in the enlarged station would enable current to be delivered at the switchboard for about 0.40 cent, with an additional overhead of about 0.20 cent per kilowatt-hour, a total of about 0.60 cent per kilowatt-hour. If the true figures were considered, it would involve a loss of about $500,000 per annum to shut down the private plant and purchase current, instead of achieving a saving of $30,000, as indicated by the cost department.

David Rushmore, chief engineer, power and mining department, General Electric Company, Schenectady, N. Y., held that a proper distribution of costs was only one-half of the problem. The other half was the analyzing of the data obtained and making it of real use in the operation of the factory. He called attention to the opportunity which lay before the society to standardize cost accounting for industrial plants, exactly as it had established many mechanical standards.

Mr. Neeley presented a diagram, reproduced herewith, which indicates in a rough way the percentage of factory output at which a profit becomes a loss, and at which it will pay to shut down the factory. The ordinates are dollars of output laid out to any convenient scale, and the abscissae represent percentage of factory operation. Fixed charges are represented as a line at a constant dis-

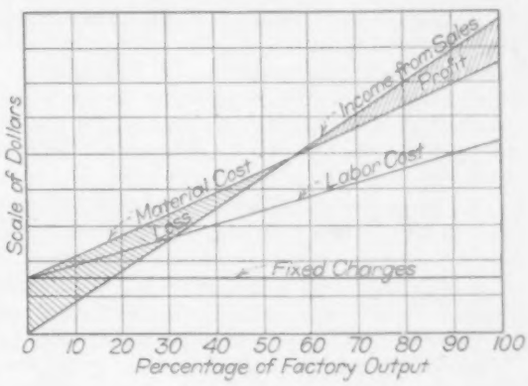


Diagram Showing When Factory Operation Becomes Unprofitable

tance from the base. Lines representing labor cost and material cost are drawn from the intersection of the fixed charges line with the ordinate of zero production. The line of sales income is drawn from the origin of the diagram as shown. The area between the material cost line and the base represents the total cost of operation of the factory. The point where the line of sales income enters this area is the point at which factory operation becomes unprofitable, and at which the factory should cease operations.

In his closure Mr. Gantt asked for a careful consideration not only of methods of cost keeping but of methods of improving efficiency in general. He called a halt on "efficiency engineers" who are efficient in name only, as well as on cost accountants who have an imperfect understanding, or no understanding, of factory problems. He emphasized that "efficiency" is a means not an end, and that it is better to do something worth while inefficiently rather than to do something not worth while in a highly efficient manner. "For instance," said Mr. Gantt, "for many years we marveled at the wonderful industrial efficiency of Germany. Since the great war began we have marveled still more at her military efficiency. What lasting good has either done for Germany?" Efficient manufacturing and efficient cost accounting must go hand in hand to make a better product, better and more contented workmen, and to establish better relations among the public, the capitalist and the workman. If they do not do this they are not worth while. If they mean more wealth for the few and less wealth for the many, more power for the employer and less rights for the employee, then they must stop. Industrial bankruptcy is better than high efficiency under these conditions.

At the conclusion of the discussion a motion was passed for the appointment of a committee to investigate the subject of cost systems for industrial establishments.

Lubrication of Journal Bearings

The laws governing the lubrication of journal bearings were discussed in a paper by M. D. Hersey, assistant physicist United States Bureau of Standards. The discussion which resulted was a highly technical one. The general trend of opinion, however, was to agree with the author, and it empha-

sized the value of the work done by him and the necessity of carrying on further experiments on the subject. The viscosity of the lubricant appeared to have a predominating influence on the results, but it was brought out that all oils of equal viscosity do not have an equal lubricating value. One speaker thought that the surface finish of the bearing and its hardness play a more or less important part in the breaking down of the oil film, and asked that these features be investigated in future experiments. Several practical conclusions were drawn by another speaker, among them the following: The length of bearings should at least be three times the diameter; the lubrication conditions for high-speed bearings should not be determined from data obtained on low-speed bearings; high-speed bearings can be allowed to become warmer than low-speed bearings without endangering the mechanism; water can be used as a lubricant for bearings running at 3000 r.p.m. or more, providing a means can be found for lubricating the bearings while they are being brought up to their normal running speed.

It was suggested that the laboratories of American technical schools could render valuable assistance in gathering data and carrying the experiments outlined in the paper still further. After some discussion of this point, Calvin W. Rice, secretary of the society, stated that the research committee of the society was established for the purpose of instituting researches of the character outlined, and that the co-operation of technical schools was in mind when the committee was appointed. He also said that this work came within the province of the Engineering Foundation. A resolution was accordingly passed requesting the council to take up with the Engineering Foundation the desirability of instituting a further research into lubrication problems, in conjunction with the research committee and the technical schools.

Portland Cement and Concrete Structures

A paper profusely illustrated with micro-photographs and treating of the mechanical features of the hydration of Portland cement and the making of concrete was presented by Nathan C. Johnson, Raymond Concrete Pile Company, New York, who instituted a microscopic investigation of the materials entering into concretes, similar to those conducted on steels. This was done to ascertain, if possible, the basic relations between the constituent materials in concrete. As a result, new knowledge has been obtained with regard to the functions of the various dissimilar ingredients of the concrete and as to the detrimental effects of foreign impurities, such as entrained air. An explanation is offered as to why, even with the best of materials, only low-strength structural material is obtained. The production of binding substance, through the hydration of cement, was also investigated by the microscope and a surprisingly low efficiency of use is found to obtain in all concretes.

The various speakers on this topic confined themselves mainly to the citation of examples of peculiar behavior of concrete. One such case was in San Francisco, where the concrete in a portion of a reinforced concrete structure refused to set for a considerable period of time, although every known expedient for hastening the setting was tried. The conclusion was finally reached that there was something fundamentally wrong with the cement itself and that the building would have to be taken down and the concrete replaced. The night before this work was to be started, however, a slight earthquake occurred, and on the following morning the concrete was found to have set as hard as granite. An engine foundation which acted in a somewhat similar manner was also described, except that the foundation was finally taken down. A few days later the fragments on the scrap pile were also found to have become like granite. No explanation was offered for this behavior, except the possible one that the shock of the earthquake and of the removal of the engine foundation had relieved some intermolecular stress in the concrete which had previously prevented its setting. It was further observed that new machinery foundations which were not as hard as might be desired had suddenly become extremely firm when machinery was started in the vicinity, setting up a slight vibration. A practical conclusion that was drawn from the discussion was that it is unwise to condemn too hurriedly what is considered poor concrete.

Effect of Humidity on Belts

The effect of relative atmospheric humidity in oak tanned leather belts formed the subject of an investigation by William W. Bird, professor of mechanical engineering, Worcester Polytechnic Institute, and Francis W. Roys, the results of which were presented at this meeting. The principal effect noted in the study, which was on a 4-in. single belt, was the lengthening of the belt with an increase in the humidity, thus decreasing the belt tension if the distance between pulley centers is maintained constant. This effect varies with the humidity and is less at low temperatures and greater at high temperatures. It is not, however, in direct proportion to the absolute humidity.

The authors draw four useful conclusions from their studies, as follows:

1. If a belt be set up at a low relative humidity, slipping will occur with a marked rise in the humidity, especially if it is accompanied with a rise in temperature.

2. If a belt be set up at a high relative humidity, excessive stretching and excessive pressure on the bearings will result from a decided decrease in the relative humidity, especially if accompanied by a fall in temperature.

3. If a belt be set up at a medium relative humidity the tensions will not be excessive at low relative humidities nor will there be any great danger of slipping at high relative humidities unless accompanied by excessive temperature changes.

4. If a belt be set up at any relative humidity with a spring or gravity tightener, a load 50 per cent greater than the standard can be transmitted at either high or low humidity without danger of stretching the belt, slipping or excessive pressure on the bearings.

Carl G. Barth, in commenting on the paper, confirmed the conclusions of the authors as agreeing with his own experience and with the results of investigations conducted by him and the late Frederick W. Taylor. He stated that the effect of humidity was not sufficiently considered in setting up belts in the shop, and expressed a hope that further investigations would be made on the subject.

One member offered objection to the paper as being a fine laboratory experiment but of little practical use, because belts in the shop were not run under laboratory conditions and the results obtained in the laboratory could not or would not be duplicated in the shop, and that it was impractical to insure the tensions called for by the paper being maintained in the factory. His argument was demolished by others, however, who told of numerous cases where the belts were systematically main-

tained, inspected and taken down at regular intervals to have their tension measured and readjusted when necessary. Belts cared for in this manner gave little trouble, lasted longer and transmitted a greater amount of power than belts which were left to the care and attention of the men.

The subject of tightness received considerable attention in the discussion, and it was brought out that automatic, spring loaded or gravity tighteners were of great value in reducing belt troubles and the cost of belt repairs. It was further pointed out that it was desirable to run belts with the tension on the slack side at the minimum possible figure. The use of an idler pulley in connection with an automatic tightener permitted the tension to be reduced far below the point where the belt would run off the pulley without it, and thus enabled the transmission of far heavier loads than are ordinarily considered possible.

As a suggestion for carrying out further studies on the effect of humidity on belts it was proposed that some technical school build three rooms in which the humidity could be maintained at a constant figure, and run therein three belts cut from the same roll, under three different sets of conditions of humidity and tension. Each test should be continued for one year in order that data could be obtained which would give some idea of the effect of humidity on the life of the belt as well as on its transmitting power. Further experiments could be made with the belts treated with some of the standard belt dressings to ascertain whether or not these had any effect on the life of the belts.

Commenting further on the effect of tightness, a speaker pointed out that the cost of the belt, of belt repairs, and the cost of the tightness should have comparatively little consideration, if they, as the authors claimed, reduced the belt breakdowns and prevented machinery and workmen from standing idle in working hours while the belt was being repaired. The loss due to idle machinery would as a rule far exceed the cost of equipment necessary to insure its continuous operation.

Heat Treatment of Motor Truck Axles

John Younger, of the Pierce-Arrow plant, described experiments made to determine the cause of failure of the axle shafts of motor trucks. The shaft under investigation was made from chrome-nickel steel, turned all over to 2.1235 in. diameter. The chemical and physical properties were as follows: Carbon 0.20, chromium 1.5, manganese 0.30, nickel 4.00, silicon 0.20, phosphorus and sulphur less than 0.04; elastic limit 90,000 lb. per square inch, maximum strength 105,000 lb. per square inch, reduction in area 66 per cent, elongation 25 per cent. The shafts failed by twisting off at the ends, where splines had been cut in them.

In the experiments a truck was surged to and fro by its own power in a cradle which gave heavy shocks to the rear driving axle in alternate directions, exactly as would be the case in service. The two shafts in the test truck failed after 5141 blows had been endured by one, and slightly more by the other. The results of the experiments and of calculations and other studies revealed quite clearly that the splines were a source of weakness, confirming a report on a railroad accident recently, in which it was shown that serrations in a tender axle led to its breakage and the consequent derailment of the train.

As the quality of manufacture could not be improved, only the material could be altered to remove the trouble caused by the failure of these shafts. It was decided that if the elastic limit of the steel could be raised, the shafts would stand up better. A series of experiments were instituted which revealed that heat treatment would give a steel with an elastic limit of 175,000 lb., and a new specification of steel for the shafts was made as follows: Carbon, 0.30; manganese, 0.50; chromium, 1.5; nickel, 3.5; elastic limit, 175,000 lb. per square inch; tensile strength, 185,000 lb. per square inch; elongation, per cent in 2 in., 14; reduction of area, 53 per cent. Shafts made of this steel have given satisfactory service.

The shafts are now machined from hot rolled bars, already heat treated to show an elastic limit of 100,000 lb. They are then heated in a gas furnace to between 1450 and 1500 deg. Fahr. and quenched in oil, after which they are heat treated to about 700 deg. Fahr. and cooled slowly in air. The Brinell hardness number of the heat treated shaft should be 402 to 444.

The discussion resolved itself into two phases. Stress was laid on the value of an engineering investigation being made on a subject of this character, in which the conditions of service were exactly duplicated in the investigation. When this is done the value of the study is much enhanced. The second phase of the discussion emphasized the necessity of the proper heat treatment of alloy steels. The heat treatment plays an extremely important part in the utilization of alloy steels, and such a steel that is not heat treated or which is improperly heat treated is little better or no better than carbon steel of corresponding quality. The question was raised in this respect as to the danger that might arise from failure to treat properly one or more forgings in a given lot. The author replied that the Brinell hardness test was an unfailing indication as to the correctness of the heat treatment, and that each piece should be subjected to a Brinell or scleroscope test as a part of the regular inspection. Prof. H. Wade Hibbard, professor of mechanical engineering, University of Missouri, Columbia, Mo., spoke of the value of heat treated alloy steel in machinery parts and earnestly recommended its more general adoption for this purpose.

CORRUGATED FURNACES FOR VERTICAL BOILERS

F. W. Dean, mill engineer and architect, Boston, presented a design of vertical fire-tube boiler which dispensed with the use of furnace staybolts by the adoption of a corrugated furnace. Boilers of this type have been built up to firebox diameters of 72 in. and of 200 hp. capacity. The steam pressure which could be carried by such a boiler is 200 lb. per square inch, and a superheat of from 20 to 40 deg. is obtained in the boiler itself.

Divergent opinions were expressed as to the value of the construction proposed by Mr. Dean. W. F. McGregor raised the objection that the expansion of the furnace would produce excessive leakage on the tube sheets, and he also questioned the safety of the boiler as compared with the ordinary staybolted construction. Prof. H. Wade Hibbard severely criticized the method of staying the upper tube sheet, which method utilizes a bent stay. Under the conditions of operation given in the paper the stays would be at a blue heat—the most brittle condition of steel—and they would while in this temperature be constantly subjected to flexure with the varying expansion and contraction of the tubes and boiler, producing a dangerous situation. It was pointed out by others, however, that a slight change in the form of the upper tube sheet would obviate this difficulty, and that aside from this one point the boiler was fully as safe as the ordinary type. It was brought out, however, that the vertical fire-

tube boiler was an uneconomical type of steam producing apparatus as regards fuel consumption, and that there was little or no reason for building a boiler of this type, of the capacity and for the pressures given by Mr. Dean.

NOMINATIONS AND CONSTITUTIONAL AMENDMENTS

At the business session Wednesday morning the nominating committee appointed to nominate officers to be voted upon at the annual meeting in December handed in the following nominations:

President: D. S. Jacobus, Babcock & Wilcox Company, New York.

Vice-presidents: William B. Jackson, D. C. & William B. Jackson, engineers, Chicago; J. Sellers Bancroft, general manager, Lanston Monotype Company, Philadelphia, and Julian Kennedy, consulting engineer, Pittsburgh.

Managers: John H. Barr, consulting engineer, Union Typewriter Company, New York; John A. Stevens, consulting engineer, Lowell, Mass., and H. DeB. Parsons, consulting engineer, New York City.

Treasurer: William H. Wiley, New York.

At the same session it was reported that the constitution had been amended to provide for a permanent committee on standardization. Two other amendments were proposed at this session, one of which changed the number of members who may elect themselves a special nominating committee from twenty, as at present, to 1 per cent of those entitled to vote. The other amendment was so worded as to require the society to claim copyright on all reports, papers, etc., published by it, and specifying the conditions under which republication by others may be made. At present the society is prohibited from copyrighting any of its publications.

OTHER FEATURES OF THE MEETING

In addition to the papers outlined above, there were others presented, upon which there was little or no discussion. These included the subjects of gas measurement, turbine pump design, condenser design, and concrete beams. There was, in addition, one paper of a highly mathematical character on the subject of model experiments and the forms of empirical equations. Despite its forbidding appearance, this paper excited almost as much interest as any of the others. The discussion principally turned upon the use to which models could be put as a means of predicting the performance of full-sized apparatus. One phase of the discussion which was particularly interesting dealt with the possibility of predetermining the distance to which locomotive sparks would be projected under varying conditions of wind and speed. This is of great importance to the railroads, according to railroad men who took part, in view of the damage suits they are required to defend on account of fires which are alleged to have been started by sparks from locomotives. Although there are several difficulties in the way, it developed that it would be quite possible to conduct model experiments on this subject with the probability of obtaining results of real value.

On Wednesday evening a brilliant illustrated lecture was delivered by Dr. F. H. Newell on "The Engineer as a Citizen." Dr. Newell described the work of the engineer in the reclamation of the arid deserts in the West, and in it he characterized the engineer as a man who had visions, and who then went to work to make his visions realities. He mildly criticized the engineer for his failure to take the credit due him for his share in making America what it is to-day, and demanded that he work to achieve the place in public affairs that is held to-day by the lawyer, the financier and the business man.

Numerous manufacturing establishments in Buffalo and Niagara Falls opened their doors to the visiting engineers, and the privileges offered were widely used. Among the plants were the Lackawanna Steel Company, the Pierce-Arrow automobile factory, the Larkin soap works, the American Radiator Company, the Niagara Power Company, and many others.

The spring meeting of 1916 will be held at New Orleans.

BOILER MAKERS' CONVENTION

Concluding Features of Last Week's Meeting at Erie, Pa.

The methods of securing the adoption by State enactment and otherwise of a standard boiler code, known as the A. S. M. E. code, were important features of the closing sessions of the meeting of the boiler manufacturers at Erie, Pa., June 21 and 22, as they were of the sessions reported in last week's issue. What remains to be covered therefore are the questions of the technical features of the code and of a uniform inspection law.

TECHNICAL FEATURES OF THE CODE

Speaking of the technical features of the code, from the standpoint of the steam users, John A. Stevens, chairman of the American Society of Mechanical Engineers' committee, told how it was practically an adoption of the Massachusetts boiler rules, with a long look ahead into the future, to provide for developments in the art of boiler manufacture and operation. He laid stress on the necessity of pushing the general adoption of the code throughout the United States to insure uniformity of specifications. The manufacturers are to-day under a hardship, in that boilers made for service in, say, Massachusetts, will not meet the approval of the authorities in Ohio. This precludes the manufacture of stock boilers and increases the expense both to the manufacturer and user. The A. S. M. E. code is the best one to adopt, because it combines the best features of all codes, and represents the combined effort of all the best authorities on boiler manufacture and use. The important point, however, was not necessarily the adoption of this particular code, but of some code that would be uniform throughout the country, in order to remove the conflicts in laws under which boiler manufacturers now labor. Other speakers laid stress on this point.

Speaking for the material manufacturers, C. L. Huston, vice-president Lukens Iron & Steel Company, explained some of the changes which had been made in formulating the code in the interest of better material. He explained particularly the difference between fire box steel and flange steel, the former being used for surfaces which are exposed to the products of combustion, and which are under pressure. These surfaces require material which has had more careful workmanship, and a higher degree of inspection to eliminate internal and surface defects, which would cause failure under the combined influence of pressure and heat. The difference lies principally in the workmanship and inspection, and amply justifies the higher price asked for firebox steel.

A UNIFORM BOILER INSPECTION LAW

F. R. Low, reporting for the committee appointed to consider a uniform boiler inspection law, presented a draft of a law which it is intended shall serve as a pattern for the various States in drawing up inspection laws by means of which the boiler code shall be enforced. The law provides for the creation of a bureau of steam engineering, presided over by a chief, appointed by the governor. The bureau is charged with the inspection of the design, construction, condition and installation of each boiler in the State, and is

empowered to issue permits to operate inspected boilers and to license men to run boilers and engines. The law provides for annual inspections, and the keeping of complete records of every boiler inspected. Provision is made for the appointment of inspectors to carry out the law, and it is also provided that the inspectors of any authorized boiler insurance company may be licensed as inspectors, to inspect only boilers insured in their respective companies. Such boilers are exempt from State inspection. Provision is also made for the conduct of examinations of applicants for licenses to operate steam apparatus, and for appeal by applicants who fail to pass the examination; the power to revoke licenses is also given in the act. The law also makes it unlawful to install a boiler which does not conform to part I of the A. S. M. E. code, and it requires a shop inspection of the boiler while under construction. Existing boilers are required to be made to conform to part II of the code.

The reading of this draft provoked long and acrimonious discussion. Exception was taken by several manufacturers to the provision for shop inspection of the boiler while under construction. They felt that this would impose an unnecessary hardship on the small boiler maker in the small town, where the expense of securing an inspector would be prohibitive, compared with the expense which the large manufacturer in a large city, where there would be inspectors available at all times. Furthermore, they felt that if a manufacturer in Indiana, for instance, was building a boiler for use in Maine, he would be under the necessity of sending to Maine for an inspector licensed by that State, which would put him to great expense, and at no particular benefit to himself. Arguments were set forth for the incorporation in the law of a provision similar to that in the Canadian laws, whereby a manufacturer submits his drawings to the proper department of the provincial government, and after their approval he is permitted to build and install his boiler. If, after the boiler is installed, the local inspection shows that it has not been built in accordance with the approved drawings, it is rejected and returned to the builder. The risk of having the boiler rejected after its completion would, it was held, act as a sufficient deterrent against scamped work to warrant the elimination of the shop inspection.

In refuting these arguments, Mr. Low pointed out that the boilermakers themselves needed protection against those manufacturers who would take advantage of the absence of a shop inspection to produce inferior work on the chance that it might be overlooked in the final local inspection. Such men would be able to underbid the honest manufacturer, and would injure his business to a great extent. Even though the practice of inferior workmanship would eventually work to the detriment of the unreliable manufacturer and might eventually put him out of business, nevertheless, the injury suffered in the interval by the man who observed the letter and spirit of the code would be great and irreparable. Mr. Low argued further that the expense of shop inspection would be no greater than that of a final inspection if it were necessary to cut out rivets and drill plates in order to find out whether the boiler had been built according to the code. If it were possible to put every boiler manufacturer on honor, to build his boilers according to the code, then perhaps the shop inspection could be eliminated, but as society is now constituted, it is impossible to do this.

The discussion further developed a desire on the part of a large number of those present to split the three matters which were to be brought before the various State legislatures into three separate laws, and not to jeopardize legislation on any one subject by opposition that might be developed against another. That is, instead of combining action on the code, on boiler inspection, and on the licensing of operatives in one law, they should be taken up as separate matters as circumstances should render most expedient. A resolution was finally passed that the draft of the law as submitted by Mr. Low be adopted by the Administrative Council to be used as a model upon which to pattern the laws which the council would endeavor to have passed in the various States. This council was empowered in other resolutions to take any steps it might deem necessary to promulgate the code and to secure such legislation as would be needed to put it in force. The council was directed to call upon the members of the association for any assistance it might require to secure the passage of legislation in their respective States.

Before the close of the convention, steps were taken by several of the allied interests to select their representatives on the council.

UNIFORM COST ACCOUNTING

The report of the committee on uniform cost accounting was presented by H. D. Mackinnon. This report briefly analyzed the replies received from about 75 boiler manufacturers to a series of questions relating to their practice in cost accounting, and recommended the adoption of a set of forms which would tie the accounting system to the shop system and to the sales department. It recommended that the following items be included in the calculation of overhead expense: Depreciation on buildings and machinery; taxes; insurance; power; heat; light; general expense; barn, cartage and teaming; advertising; workmen's compensation insurance; drafting and estimating; repairs to buildings, equipment and machinery; traveling and sales expense; clerical labor; non-productive labor and interest on investment. It also recommended the apportionment of overhead as a percentage of the payroll or direct labor charge, instead of by one of the more modern and more accurate methods.

The discussion of the report principally comprised pleas for the adoption of cost systems by those who did not now use them, as a means of eliminating cut-throat competition and as protection to the manufacturers themselves against making bids that would not net them a profit on their work.

NEW OFFICERS

The nominating committee brought in the following nominations for officers of the American Boiler Manufacturers' Association to serve for the ensuing year, and they were unanimously elected:

President, W. C. Connelly, D. Connelly Boiler Company, Cleveland (re-elected).

First vice-president, C. V. Kellogg, Kewanee Boiler Company, Kewanee, Ill.

Second vice-president, G. S. Barnum, Bigelow Company, New Haven, Conn.

Third vice-president, E. C. Fisher, Wickes Boiler Company, Saginaw, Mich.

Fourth vice-president, Isaac Harter, Jr., Babcock & Wilcox Company, New York.

Fifth vice-president, Charles S. Hooker, Union Iron Works, Erie, Pa.

Secretary, J. D. Farasey, H. E. Teachout Boiler Company, Cleveland (re-elected).

Treasurer, H. N. Covell, Gorton & Lidgerwood Company, New York.

Member of Administrative Council, E. R. Fish, Heine Safety Boiler Company, St. Louis.

It is announced that all the shops of the Canadian Pacific Railway Company will manufacture shells and other munitions for the Allies, and that the railroad shops controlled by the McKenzie and Mann interests will also turn their plants over to the British war interests. An estimate of such business so far placed in the Dominion is slightly more than $300,000,000, which does not include the Russian contract for $83,000,000 placed with the Canadian Car & Foundry Company, much of which was sublet to manufacturers in the United States, and various smaller contracts. About 200 companies in Canada are manufacturing shells at the present time.

The Canadian Car & Foundry Company has received an order from the Canadian Government for 600 standard 40-ton Intercolonial Railway freight cars, amounting to $750,000.

Present Status of Rail Specifications*

Need of Limiting Segregation and of Analyzing from Finished Rail and Not from Ladle—Promise of Heavy Sections

As users, we can and should lessen as far as possible unnecessary punishment of the rail by improvements in the mechanical design and maintenance of our equipment. We can be expected to improve our structure under the rail as our loads increase, and this change is in progress. It is but fair to say that bad conditions, both as to equipment and track structure, have contributed to rail failures. That the large number of failures of rails has attracted no more attention is because of the vigilance of the track inspection. In the very great majority of cases the rails are removed before any serious results ensue, but we must not take too much comfort from this fact, for each case offers the possibility of most serious consequences, and this is fully recognized.

Against these unsatisfactory conditions we have several possible solutions: Better steel, in the sense of more uniform steel; better steel in connection with more rational sections; materially heavier sections; or retrogression in loads and speeds. To date, a combination of the first and second has been chosen. There has been a very general change to open-hearth steel, at an increased cost.

SHORTCOMINGS OF PRESENT SPECIFICATIONS

Committees of this and sister societies have worked almost continuously on the subject of specifications. To-day, after our fourth revision in a period of eight years, our specification is almost identical with that of the American Railway Engineering Association, but the seemingly small differences are really very important. Both specifications are identical in chemical requirements; both provide that the chemistry furnished by the producer shall be that of the drillings from the ladle test ingot; but both ignore the fact that the chemistry of the actual rails, at least of part of them, is apt to differ widely from the ladle analysis. In the case of the open-hearth specifications there is at least the merit of an analysis for each heat. In the case of the Bessemer rail, the chemistry other than carbon is averaged from two complete analyses per 24 hr., to determine the quality. It is difficult to see how a specification could be made more absurd, and yet this clause in one form or another has been and still is part of many specifications, and it did not originate with our committee.

Neither the American Society for Testing Materials nor the American Railway Engineering Association specification really protects the buyer as to chemistry. Neither puts any limit on the amount of segregation permitted, and it is well known that this ranges over wider limits than would be permitted in the ladle analysis. Dr. C. B. Dudley, who did much work on standardizing methods of chemical analysis, would in his specifications not only state the composition required, but also the methods by which the determination is to be made.

THE LAMENESS OF THE PHYSICAL REQUIREMENT

From the physical standpoint both specifications are defective, as both contain the provision that if the test piece meets the requirements, the material will be accepted; but in the event of the failure of the first test piece, two more tests are made, and if both pass, the material is accepted. We hold that this is a pernicious practice, in that the consumer has positive proof that some of the accepted material does not meet the requirements.

Our own American Society for Testing Materials specification includes all the machinery for detecting physically unsound material by nicking and breaking, and then provides that the rails represented by these unsound test pieces shall be accepted as "special" rails. Presumably they are to be used in some unimportant location. It is not always possible to find unimportant places. Designating marks in the way of paint or punch marks become illegible in time. The only sure way to keep such material out of important service is not to ship it from the mill. The total additional cost per ton for eliminating both of these objectionable physical clauses is quite well known and is not large.

FEW IMPROVEMENTS IN MANUFACTURING METHODS

If we consider all the steps in our rail industry, we find very few improvements in methods other than those which lend themselves to increased output or reduced cost. There are some notable exceptions to this, three in particular: namely, the electric furnace, for producing better steel; the sinkhead process for casting ingots, for producing better ingots; and the deseaming process, for producing better rails, by mechanically removing some surface defects which would later develop into seams. All of these processes are represented by rails actually in track under observation, but it is yet too soon to justify an opinion as to their value, nor have any of these methods been generally adopted.

In this connection, it may be mentioned that, in addition to the sinkhead-process steel rail made in this country by American methods, we have, also, a small supply of ingots made in Sheffield by the Hadfield patented process, which will shortly be rolled into rail and put in service.

Heat treatment, although not yet on a commercial scale, has been attempted, and such rails are actually in service under severe conditions. So far as non-service tests go, the results are promising.

It is to be hoped that some of the large-scale experiments now in progress will show what is to be looked for from a more uniform product. One of these includes the requirement that the chemistry shall be from the rail, instead of from the ladle test ingot, and the segregation must be within reasonable limits.

DEVIATIONS FROM THE USUAL INCREASE THE PRICE

The rail situation remains very much as it was seven or eight years ago. Any deviation from the beaten path is immediately met by an increase in the price asked, the reasonableness of which the purchaser has no means of determining. In at least one case of which I have knowledge, the actual expense of every kind, so far as it could be ascertained, due to rail breakage on a certain system, was less than one-fifth of the annual increase in

*From an address delivered Tuesday evening, June 22, at Atlantic City, before the American Society for Testing Materials by its president, A. W. Gibbs, chief mechanical engineer, Pennsylvania Railroad, Philadelphia.

the cost of rail due to the introduction of a proposed new specification designed to secure the quality of rail desired. It requires a lot of courage and a strong sense of duty to justify such an expenditure when the direct return is problematical.

STRAINING RAILS IN STRAIGHTENING

There is a growing belief that the straightening press, by straining the material beyond the elastic limit, is responsible for many otherwise unexplainable failures, and it would also explain why rails from the lower part of the ingot figure so prominently in the breakage record. The rail specifications are possibly too exacting in requiring that all rails shall be "smooth, straight in line and surface, and without any twists, waves, or kinks." It is a question whether this is not asking too much for the good of the rail and whether it would not be well to make the greatest possible tolerance in the way of accepting rail with such variations from straightness as can be reasonably eliminated in laying.

As to the quality, we can not ignore the fact of the difference between rails from different mills. There have been some notoriously bad rollings, as shown by the records of various roads, and these mills have subsequently turned out an excellent product. If all of the rail was as good as the best, we would have very little room for complaint.

THE TIME FOR AN INCREASE IN RAIL WEIGHT

Personally, I believe that the time has arrived for a considerable increase in the weight of sections, and I am not so certain that a change of quality is required at the same time. One reason that appeals is the presence within recent years of that class of failures known as "transverse fissures." So far, there seems to be no satisfactory explanation. It seems surprising, if this class of breakage develops in the rail, that it should not also do so in the tire, which is subject to the same intensity of pressure. The tire, however, has an immensely greater section than the head of the rail, and it is not until from one-third to one-half of the original area has been removed by wear and turning that it becomes necessary to remove the tire from service. If the mere fact of the relatively large area or section of the tire contribute immunity from this class of failure, it is fair to assume that somewhat the same result could be looked for in the case of the rail head.

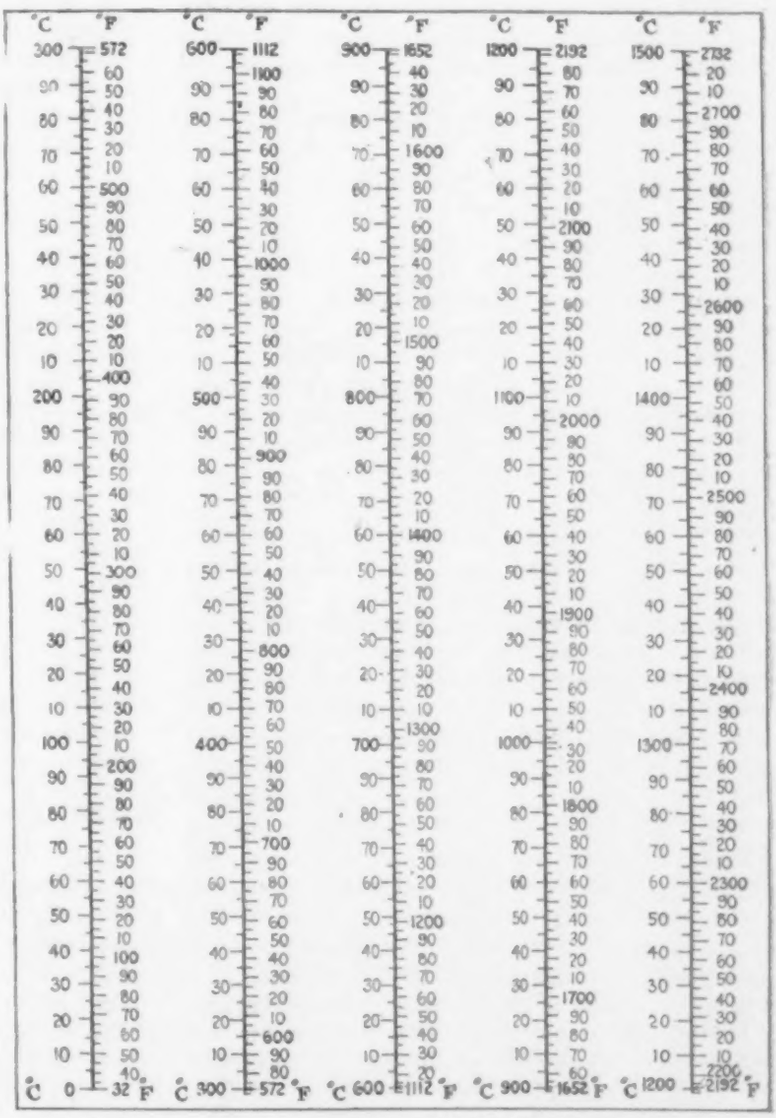
IMPROVEMENTS IN MILL METHODS

In the search for a remedy for our troubles, some have proposed to improve the product by more or less radical changes in the mill practice. Many of the questions could be settled by a small mill, in connection with a large one, at which experiments could be made without affecting the regular operations of the works. It may be feasible to provide such a mill by some form of co-operation, through which the expenses and the benefits may be distributed among subscribing companies.

In conclusion, I must repeat that the rail situation, as we see it, is disappointing. To add to the complexity of the situation, the Government, through some of its bureaus, is taking a hand and investigating every serious failure, apportioning blame and suggesting remedies. This will probably increase rather than diminish, and may some day be very awkward for the producer as well as for the user.

Conversion of Centigrade and Fahrenheit Temperatures

The desirability of employing the centigrade scale for the measurement of temperatures is becoming more and more recognized in this country, particularly in view of the fact that this scale is used almost exclusively in technical papers and publications—exclusively in those published in French or German. However, a large number of factories and laboratories still employ the Fahrenheit scale. It frequently becomes necessary, therefore, to convert one into the other. The accompanying chart has been found very convenient for this purpose. It is offered by Hugh P. Tiemann, metallurgist of the Carnegie Steel Company, Pittsburgh, as a contribution to the San Francisco meeting of the American Institute of Mining Engineers in September, 1915.



Conversion Scale for Centigrade and Fahrenheit Temperature

The City Foundry Company has moved into new quarters at 934 Hastings Street, Toledo, Ohio, occupying an up-to-date foundry building, 60 x 90 ft.

ESTABLISHED 1855

THE IRON AGE

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Conservatism in Finance

With all the reasons that exist for what has been said for months of the growing strength of this country's financial position, conservatism is still dominant. Two months ago it seemed as if Wall Street were entering upon a speculative campaign that involved danger not only to the stock market but to business in every line. International issues of the gravest import have changed the buoyant aspect of the Street to a cautious waiting for developments, and meantime events in foreign money markets have made American bankers more disposed than ever to let further events shape their policies.

It is urged in the current comment of financial writers that with the increasing plethora of money and credit facilities due to more and more favorable trade balances and to the aid of the new banking act, our banks must soon plan to get their funds at work by extending large credits to other countries. These proposals come, moreover, at a time when the railroads of the country are unable to earn money enough to make their securities attractive, and when, even if capital were to be had cheaply, there is no imperative demand for immediate large additions to equipment. Two facts in the situation seem to be influential in leading our bankers to wait for further developments. One is that domestic banks are running over with money at a time when, in the face of a great world demand for capital, the country is not prosperous enough on its own account to employ these redundant funds. The other is that since the unique financial strength of the United States is largely due to the necessitous buying here of European nations, the dominating influence will continue to be the prodigious destruction of capital in Europe. With no precedents for the present financial position of the country, naturally the disposition is not to force the future. This is the part of wisdom, in spite of the opinions volunteered from some quarters as to lack of initiative by financial interests. It is true that European holders did not hasten to throw their American securities upon this market last year, though the first judgment of many of our financiers was that they would do this. But lately high grade railroad bonds have been marketed here by British holders who were preparing to invest in their government's new bond issues, and there have been evidences of an increasing sale of foreign-held American stocks on the New York Exchange. It is inevitable that such an absorption of European holdings will continue, and the facilitating of such transactions will probably constitute the largest activity of our banks in connection with European war financing.

Some measure was taken this week, of the effect at home of Europe's high bids for capital, when New York City took bids on $71,000,000 of 4½ per cent bonds. It was not surprising that at 101.27 the average of the bids was two to three points less than for 4½ per cent bonds sold under the unfavorable conditions of 1907 and 1908. There has been so much feeding of optimism on the great prosperity the United States was to build upon Europe's distress that some object lesson was needed of the world-wide blight of the war.

Those who ten weeks ago were booming stock values and calling for full speed ahead may lay to the sinking of the Lusitania the conservatism that has marked the intervening weeks. In reality developments in world finance, which were in the making long before our complication with Germany, are largely responsible for the continued attitude of caution shown by financial interests. Liquid capital is abundant and can be had cheaply, but capital that is to be converted into fixed forms promises to be high-priced indefinitely—a condition that must be reckoned with in any appraisal of security values.

Export Prospects for Iron and Steel

The very interesting details of such iron and steel exports as were reported by weight for the month of April were presented in last week's IRON AGE, showing a total of 223,242 gross tons for the month, a gain of nearly 50,000 tons over March and a gain of nearly 100,000 tons over the average of the seven months preceding March, which comprised the first seven months of the war. There is ample reason for believing that these "tonnage" exports will amount to 250,000 tons in June. Such exports would represent a slightly higher average than has ever been maintained for a year, as the banner year, 1912, showed an average of 245,000 tons per month.

The exports of manufactures involving iron and steel, and which are not given by weight in the Government reports, are shown by the April returns to be increasing at a very satisfactory rate. The total value of exports of the tonnage products in April, together with such manufactures as are included as distinctly iron and steel products, was

$25,302,643, showing a gain of nearly $5,000,000 over March and of fully $10,000,000 over the monthly average in the seven months preceding March. Of itself this showing is quite satisfactory. But the actual condition, from the viewpoint of iron and steel producers, is still more satisfactory, for two reasons: First, that the manufactures of iron and steel included in the totals just mentioned are increasing in the heavy products more than in the light products; second, because manufactures not included under iron and steel in the Government category, but still involving iron and steel consumption, are also growing at a good rate.

To select enough items to make a fairly formidable showing, a comparison of manufactures included under "iron and steel" in April last and April a year earlier, there were decreases in value shown by the following, and usually large decreases: Adding machines, cash registers, typewriters, linotype machines, printing presses and sewing machines. The following showed increases: Lawn mowers, metal working machinery, milling machinery, paper mill machinery, refrigerating machinery, shoe machinery, sugar mill machinery and textile machinery. As a rule these manufactures involve more weight of iron and steel per dollar of value than do the others. Apparently they illustrate, too, the wide range of demand for machinery created by the war. The most striking illustrations of increases in the April to April comparison, are: Metal working machinery, $1,308,821 to $3,300,953; refrigerating machinery, $86,820 to $163,947; shoe machinery, $108,174 to $144,950, and sugar mill machinery, $70,196 to $199,401.

In manufactures involving the consumption of iron and steel, but not returned under the iron and steel heading, satisfactory progress in export trade is being made. Agricultural implement exports in April were valued at $1,534,715, or 165 per cent in excess of the average in the nine months preceding, and only 40 per cent less than the exports in the preceding April. While the motor truck exports in the earlier months of the war appeared large, they prove almost insignificant compared with the exports in more recent months. In the seven months August to February inclusive 4924 motor trucks were exported, or 700 per month, but March showed 1339 trucks and April 2267 trucks. The trucks exported in April were valued at more than $2300 apiece and necessarily involved a considerable weight of steel. Passenger automobiles, the exports of which dropped sharply immediately after the war started, are attaining their old rate, the increase being from an average of 1124 per month from August to February inclusive, to 2329 in March and 3078 in April.

Shrapnel is included with explosives when loaded and with unenumerated iron and steel when shipped unloaded. Explosives averaged $1,698,300 per month in the seven months of the war ended with February, increasing to $2,793,530 in March and to no less than $6,076,883 in April. The weight of steel involved in such a value is of course far from large.

As to unloaded shrapnel, our Washington correspondent was recently advised, as noted in THE IRON AGE of June 17, that unloaded shrapnel is included in "all other manufactures of iron and steel" and that since the war started the exports of such miscellaneous manufactures, apart from shrapnel, have been very small. The figures show an average for "all other manufactures of iron and steel" of $1,194,362 per month in the seven months August to February inclusive, while they increased slightly to $1,363,693 in March and then jumped to $2,800,750 in April.

Electrical exports, involving very little iron and steel, make a very favorable showing in April, at $2,055,375, a fair increase over the average of preceding months and an increase of 18 per cent over those of April a year earlier. Incandescent lamps, included under this heading, decreased very sharply from April to April, while dynamos, motors and static transformers decreased materially. Telegraph and telephone instruments increased slightly, while insulated wire and cables quadrupled, increasing from $86,993 to $354,344. It does not seem difficult to fathom the occasion of that increase.

Universal Adoption of the Boiler Code

A significant remark was made by one of the speakers at the boiler manufacturers' convention at Erie last week, on the value of the new boiler code of the American Society of Mechanical Engineers. Speaking for the consulting engineers, he said that for one ne was glad to be able to shift the responsibility of providing a safe boiler from his individual shoulders to the code. The possibilities of death and of severe injury to persons and damage to property which exist in a boiler are so great that the design should not rest on the judgment of one man. An improperly designed boiler, or one in which there has been a slight error in judgment on the part of the engineer, is one of the most dangerous things on earth, and no rules can be too rigid and no fund of experience can be too large to be drawn upon, if they will absolutely eliminate these errors of design and judgment. The benefits which the designing engineer will derive from the universal adoption of the code are so great that they should impel every engineer to lay aside his private ideas as to boiler design and work whole-heartedly for the incorporation of the code into the laws of every State in the country. Representing as it does the best practice and the widest experience of every branch of the boiler building and steam using industries, it necessarily goes far beyond the knowledge of the individual designer.

The universal adoption of the code by the several States is an end to be earnestly worked for. It will benefit not only the designer but also the manufacturer and the user. It will safeguard the public in that it will remove the menace of dangerous boilers in crowded localities, under sidewalks, and in hundreds of other places where a boiler explosion may do untold damage.

The manufacturers will be relieved of the necessity of carefully scrutinizing the State laws where their product is to be used, and of building a special boiler for each State. Instead of having to build boilers to forty-eight different sets of specifications, they will, on the universal adoption of the code, have to build to but one set. The expense of manufacture will be decreased, and also the expense of inspection. An approval of a boiler by an inspector

in the manufacturer's own State ought to insure the acceptance of it in every other State. The manufacturer then can build boilers for stock, a thing which he is now unable to do, except to a limited extent.

The large user of boilers will also benefit to no small degree from the universal adoption of the code. A corporation operating plants in two or more States is to-day compelled to have boilers constructed according to the codes of the States in which they are to be used. Good engineering demands that apparatus for the same service be of uniform design. This applies to boilers just as much as it does to any other kind of machinery. In the present state of the boiler laws this uniformity is impossible, if the concern happens to operate boilers in two different States. This condition also precludes the possibility of moving boilers from one State to another, which in the case of many establishments has been considered desirable. This is particularly true of contractors who, under the present state of affairs, are compelled to keep up several duplicate sets of equipment of hoisting engines, because of the variation in the boiler laws of the States in which they take contracts. The same thing is true of industrial locomotives, of steam shovels, etc.

It is seldom that a case is found where the best interests of all concerned—buyer, seller and general public—are so well served as they will be by the universal adoption of the boiler code. It is therefore to be hoped that the decision of the Erie convention to press this adoption will meet with early and well-merited success.

CORRESPONDENCE

The Henry Ford Furnace Not Needed

To the Editor: If Henry Ford is really a philanthropist he should not build another blast furnace. Should he do so, he will be taking the bread out of somebody's mouth. But if he builds his new tractor plant and buys his pig iron in the market then he will be doing the merchant furnaces of the country a service.

The condition of the merchant furnaces is deplorable. One great consumer of pig iron after another has built his own blast furnaces, and the merchant furnaces have seen, year after year, their market grow more and more restricted. The foundry trade has not increased fast enough to replace the mill trade which has been lost. To-day the problem of the merchant furnaces is acute.

MERCHANT FURNACE OWNER.

The selling value of display cards shown in dealers' shops and containing the actual articles for sale has been proved in the experience of the McCaffrey File Company, Philadelphia, which places a dozen files, such as those for cleaning contact points and spark plugs and for other uses known to automobilists, on a single card and ships six cards in a box with wax paper protection between cards, so that the files on the cards are kept clean until needed for display.

The Hydraulic Pressed Steel Company, Cleveland, Ohio, will enlarge its plant by the erection of a structural steel building, 80 x 300 ft. The extensions will be made to increase the capacity of all the company's departments. A 10-ton electric traveling crane, with 80 ft. span, will be purchased, and probably some other equipment will be required.

New England Business Notes

The jewelry manufacturing trade, which centers in the Providence territory, is profiting to some extent by the opportunity to sell the output of some of its presses, and especially of screw machines, which constitute a part of the equipment of a few of these establishments.

The high price of copper, which has prevailed for some time, has resulted somewhat directly in the redesigning of electric switches, so that steel now predominates in their construction with no loss of efficiency, it is claimed by the various Hartford manufacturers who specialize on this product.

The brass manufacturing territory is profiting by the exclusion of European products. For example, the Waterbury Clock Company, Waterbury, Conn., which manufactures vast quantities of cheap watches bearing a familiar name, and also clocks, finds a decided increase in the demand for clocks. Frankly speaking, the German clock being out of the market, the American clock has the call. The former is no better—perhaps not so good as the United States product—but in competition it has had the predominating advantage of cheap labor. The same condition exists in many other products where brass is an essential factor, even when coupled with American automatic machinery.

The American Pin Company, Waterbury, Conn., operating a very large plant, is exceedingly busy; in fact, it has started working overtime this week. While the public is not taken into the confidence of corporations such as this, the understanding is that the increased production is largely for domestic trade.

The A. H. Nielson Machine Company, Bridgeport, Conn., is rushed to its full capacity on orders that have to do chiefly with machinery for the manufacture of war materials.

The plant of the Weed Chain Tire Grip Company, Bridgeport, Conn., is running full time with orders that have little to do with war business, except those for chains for motor trucks and other motor cars which are destined for those parts of Europe where fighting is in progress. There have been shipments of chain for some 6000 tires on foreign orders, but the large percentage of the company's business is for domestic consumption. The gain in business from last year, on the basis of the month of May, is between 20 and 25 per cent. The company reports a distinct gain from the agricultural machinery manufacturers and also from the shelf hardware trade. Prices have held close, except where costs are influenced seriously by the advance in spelter.

The Standard Mfg. Company, Bridgeport, Conn., manufacturer of electrical supplies, especially telephones and machines for the manufacture automatically of small gears and pinions and similar parts, is exceedingly busy, chiefly in the machine department. A strong demand is found for jig and fixture work. The Standard Company has set a room aside for this class of product.

The Automatic Machine Company, Bridgeport, Conn., and Providence, R. I., manufacturer of machinery of various types, is busy in all departments. The Providence plant, formerly the Providence Engineering Works, is operating to capacity on shrapnel work, and the Bridgeport shops are equally busy on orders for machine tools. The great problem with the plants is that of labor.

In Providence, Beaman & Smith, the Builders' Iron Foundry and its allied interest, the Diamond Machine Company, are working at high capacity, and the machine shops in general are working at full capacity.

In spite of the rush of orders the Brown & Sharpe Mfg. Company, Providence, R. I., will close its plant for its annual vacation to employees from Aug. 7 to 16, following a custom which was established some years ago. The offices will remain open, however, and general business will be transacted as usual.

Finley P. Mount, Indianapolis, receiver for the M. Rumely Company, La Porte, Ind., has sold oil-burning traction engine to the Russian Government amounting to $75,000, to be delivered at Odessa.

NAVY YARD LABOR TROUBLES

A Strike Over a Bonus Distribution — Hiring Away Army Officers

WASHINGTON, D. C., June 29, 1915.—The situation recently developed in the ordnance shops of the War Department as the result of the resignation of army officers to accept positions with private concerns manufacturing munitions of war and the hiring away of a considerable number of skilled workmen by these concerns has been rendered more embarrassing to the Government by a new incident. This is the threat of a strike on the part of some 1200 machinists and other skilled workers in the Washington navy yard who resent the inability of the Secretary of the Navy to maintain at the maximum the increase in wages authorized by Congress a year ago, but which, because the lump sum available for increase must be divided among a somewhat larger number of employees, must be reduced an average of six-tenths of 1 per cent. The organized labor leaders, quick to take advantage of the Government's predicament, not only declare their intention of calling out the men at the Washington yard unless the Secretary of the Navy agrees to violate the law by incurring a deficit in the appropriation, but promise to find the employees of the yard positions in private establishments at considerably higher wages. An appeal to President Wilson will probably be taken before a strike is ordered; in the meantime Secretary Daniels is holding a series of conferences with his aides and with representatives of the employees in the hope of finding a way out of the difficulty.

So many resignations of army officers who are recognized ordnance experts have been tendered to the Secretary of War that the Attorney General has been requested to render an opinion as to the "inalienable right" of an army officer to have his resignation accepted in time of peace. The officers in question are insisting upon their prerogative and declare that the Government will be benefited rather than injured if they are permitted to accept private employment. In one case the argument has been made that the Government arsenals are completely organized and sufficiently manned to be operated at full capacity. The private establishment to which this officer is planning to go is undeveloped in the line of producing ordnance supplies, but is planning an immediate expansion that would give it not less than six times the capacity of the Government plants. It is contended, therefore, that it is distinctly to the advantage of the Government that this particular expert should be privately employed to bring about the promised development. There is a certain amount of vagueness and lack of guarantees in this and other cases that introduces an element of doubt and that serves to remind the responsible officials of the department that a bird in the hand is worth two in the bush.

The wage controversy at the Washington navy yard is an excellent illustration of the spirit so frequently manifested by organized workmen and the promptness with which labor leaders take advantage of an employer's embarrassments. Two years ago Congress appropriated $240,000 to be pro-rated among the employees of the Washington yard as an increase over the scale then in force. This figured out a net increase to the employees averaging 7.8 per cent. It was the intention of Congress that this increase should apply also to the employees of the naval proving ground at Indian Head, but in default of a direction to that effect those at the Washington navy yard received the entire appropriation. Congress at its last session took cognizance of this fact and the declaration was specifically made in the report of the House Committee on Naval Affairs that in allotting the extra $240,000 after July 1, 1915, the workmen at Indian Head should be included. This inclusion operates to scale down the increase in the wages of the Washington yard workmen from 7.8 per cent to 7.2 per cent, and works out in practice merely as a slight revision affecting only a part of the employees, for wherever the reduction amounts to less than 1 cent per hour the wages are not disturbed. Of those affected, all but a very few will lose just 8 cents per day in their share of the Congressional bonus.

The labor leaders insist that "the departments have full authority to create deficits if necessary in order to comply with the law and some portion of the emergency fund of the department could be used to increase the employees at Indian Head." To this the officials retort that there is no authority of law for the expenditure of a dollar beyond the amount appropriated by Congress, but the rejoinder of the labor leaders is that unless the order revising the wages in the Washington navy yard is rescinded before July 1 the workmen will be ordered out. W. L. C.

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Bar-Iron Wage Scale Settled

At a conference held last week at Atlantic City, N. J., between wage committees of the Amalgamated Association and the Western Bar Iron Association, the bar-iron scale for the mills in the Central West that sign the Amalgamated scale was settled. The men asked for a slight advance in certain departments of the scale, but this was refused on the ground that conditions in the bar-iron trade do not warrant any advance in wages, and the present scale, which expires June 30, will be in force for the year commencing July 1. No changes whatever were made in the scale and it was signed in conference.

The Iron and Metal Markets

STRENGTH MAINLY IN BARS

Production and Consumption Still Grow

Galvanized Sheets Lower—Possible Buying of Billets by Steel Works

The steel trade enters upon the second half of the year with production about 50 per cent greater than on Jan. 1 and with the increase in production and consumption which has been more marked in the past two months still in progress. There is a general disposition to look for further expansion in the remainder of the year, in spite of some irregularity in prices and of the failure of pig-iron prices to reflect the improvement in finished material.

That the Carnegie Steel Company will buy billets in the East, so that it may have available for the Central West steel which would otherwise go to an eastern subsidiary of the Steel Corporation, is a possible development, but the report of such purchases is not confirmed. Three more blast furnaces of the corporation have gone in in the past week, so that it is not likely to go into the pig-iron market, as has been reported.

Steel bars still lead all finished products in activity, yet the general estimate of the steel industry and the exaggerations as to the percentage of output going abroad are based on the war boom in bars. A new French contract for 25,000 tons of shrapnel bars has been awarded to the Buffalo mill. and new bar inquiry, which is large, includes 50,000 to 60,000 tons for export and 42,000 tons of 3½-in. rounds for high explosive shells. Shrapnel and bars have only begun to figure in the export returns.

Some structural jobs long in the air are now coming to the fabricators. For a Pennsylvania freight station at Chicago 12,000 tons has been let to the McClintic-Marshall Company, and 5400 tons for the Burlington bridge at Kansas City. The American Bridge Company is low bidder on 24,000 tons for the St. Louis bridge approach, on which deliveries run to July 1, 1916.

Railroad contracts for track fastenings for the second half will be of good size. The New York Central is in the market for 30,000 kegs of spikes and 15,000 kegs of bolts besides 9000 tons of bars, and the B. & O. is inquiring for 20,000 kegs of spikes. An order for 8000 tons of rails for the El Paso Southwestern has gone to the Colorado mill.

Galvanized sheets are being readjusted and 4.50c. is now asked for No. 28. Consumers are far from being reassured, however, in view of the jump from 17c. to 21c. in spelter in the past week, and sheet mills look for no large buying until the situation is clearer. Black sheets also are far from active. Two or three Ohio mills have gone $2 to $3 below the recent level on blue annealed in the competition due to the shutting up of galvanizing plants.

Tin-plate mills are coming into better operating conditions, thanks largely to demand from abroad. A new inquiry from France is for 140,000 boxes. England and Italy are also buying.

Products in which foreign demand figures but little show spots of weakness. Plates and shapes are examples. The argument for an advancing finished steel market based on possible labor scarcity and some indications of short supply of open-hearth billets and sheet bars is met by sales here and there of 1.15c. plates and by concessions in structural shapes. Yet some large producers are holding for 1.30c. on last quarter deliveries on both bars and shapes.

Cold rolled strip steel has advanced $2 a ton after general buying on a 2.75c. basis for the second half.

In the situation that has developed in open-hearth steel in the Pittsburgh and Youngstown districts, there is a new interest in Bessemer sheet bars and billets and the market for Bessemer pig iron has felt the effect. A sale of 10,000 tons was made this week and $13.75 at furnace is now minimum.

Basic iron, on the other hand, has not been helped by the blowing in of more furnaces, as much of the additional product will be sold in the market. One interest has made very considerable sales at low prices preparatory to increasing production. In eastern Pennsylvania a purchase of 6000 tons of basic iron was made by a new buyer at close to $13.75, delivered.

Ferromanganese developments point to a tighter condition than has yet been seen, unless manganese ore supplies are much increased in the second half of the year. Imports to Great Britain as well as to this country have fallen off heavily in the past six months, but domestic shipments from Brazil were over 16,000 tons in May, after being less than 1000 tons in the three months preceding.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type. Declines in Italics

At date, one week, one month and one year previous

	June 30, 1915.	June 23, 1915.	May 26, 1915.	June 24, 1914.
Pig Iron, Per Gross Ton:				
No. 2 X, Philadelphia....	$14.25	$14.25	$14.25	$14.75
No. 2, Valley furnace....	12.50	12.50	12.75	13.00
No. 2 Southern, Cin'ti....	12.65	12.65	12.40	13.50
No. 2, Birmingham, Ala..	9.75	9.75	9.50	10.25
No. 2, furnace, Chicago*.	13.00	13.00	13.00	13.75
Basic, del'd, eastern Pa..	13.75	13.75	13.25	14.00
Basic, Valley furnace...	12.65	12.65	12.50	13.00
Bessemer, Pittsburgh....	14.70	14.70	14.70	14.90
Malleable Bess., Ch'go*..	13.00	13.00	13.00	14.00
Gray forge, Pittsburgh..	13.35	13.35	13.45	13.65
L. S. charcoal, Chicago..	15.75	15.75	15.75	15.75
Billets, etc. Per Gross Ton:				
Bess. billets, Pittsburgh..	21.00	21.00	20.00	19.00
O.-h. billets, Pittsburgh..	21.00	21.00	20.00	19.00
O.-h. sheet bars, P'gh...	22.00	22.00	21.00	20.00
Forging billets, P'gh.....	27.00	27.00	26.00	25.00
O.-h. billets, Phila.....	22.02	22.02	22.02	22.40
Wire rods, Pittsburgh...	25.00	25.00	25.00	24.50
Finished Iron and Steel,				
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia..	1.22½	1.22½	1.17½	1.17½
Iron bars, Pittsburgh....	1.25	1.25	1.20	1.25
Iron bars, Chicago.....	1.20	1.20	1.15	1.05
Steel bars, Pittsburgh....	**1.25**	1.20	1.20	1.10
Steel bars, New York....	**1.419**	1.369	1.369	1.26
Tank plates, Pittsburgh.	**1.20**	1.15	1.15	1.10
Tank plates, New York..	**1.369**	1.319	1.319	1.26
Beams, etc., Pittsburgh..	1.20	1.20	1.20	1.10
Beams, etc., New York..	1.369	1.369	1.369	1.26
Skelp, grooved steel, P'gh	1.15	1.15	1.15	1.15
Skelp, sheared steel, P'gh	1.20	1.20	1.20	1.20
Steel hoops, Pittsburgh..	1.30	1.30	1.25	1.25

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire,	June 30, 1915.	June 23, 1915.	May 26, 1915.	June 24, 1914.
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh.	1.75	1.75	1.75	1.80
Galv. sheets, No. 28, P'gh	4.50	5.00	3.75	2.75
Wire nails, Pittsburgh...	1.55	1.55	1.55	1.50
Cut nails, Pittsburgh....	1.55	1.55	1.55	1.55
Fence wire, base, P'gh...	1.35	1.35	1.35	1.30
Barb wire, galv., P'gh..	2.40	2.40	2.10	1.90
Metals.				
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York.	22.50	22.50	21.00	14.12½
Electrolytic copper, N. Y.	20.00	20.00	18.50	13.75
Spelter, St. Louis.....	**21.00**	17.50	18.75	4.90
Spelter, New York.....	**21.50**	18.00	19.00	5.05
Lead, St. Louis.....	**5.60**	5.35	4.22½	3.80
Lead, New York.....	5.75	5.75	4.30	3.90
Tin, New York.....	40.00	41.25	37.87½	30.75
Antimony, Hallett's, N. Y.	none	none	none	6.75
Tin plate, 100-lb. box, P'gh	$3.10	$3.10	$3.15	$3.30
Coke, Connellsville,	Per Net Ton at Oven:			
Furnace coke, prompt....	$1.60	$1.60	$1.50	$1.75
Furnace coke, future....	1.75	1.75	1.65	1.85
Foundry coke, prompt...	2.00	2.00	2.00	2.30
Foundry coke, future....	2.25	2.25	2.15	2.50
Old Material,	Per Gross Ton:			
Iron rails, Chicago.....	12.25	12.25	12.25	12.75
Iron rails, Philadelphia..	15.00	15.00	15.00	15.00
Carwheels, Chicago	**10.75**	10.50	9.75	11.50
Carwheels, Philadelphia..	11.50	11.50	11.50	11.00
Heavy steel scrap, P'gh..	11.75	11.75	11.75	11.50
Heavy steel scrap, Phila.	11.25	11.25	11.00	10.50
Heavy steel scrap, Ch'go.	**9.75**	9.50	9.50	9.75
No. 1 cast, Pittsburgh...	12.25	12.25	12.00	11.50
No. 1 cast, Philadelphia.	12.25	12.25	12.25	12.00
No. 1 cast, Ch'go (net ton)	9.00	9.00	9.00	9.75

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes. The foregoing rates to the Pacific coast are by rail. The rate via New York and the Panama Canal has no stability, being dependent on vessel charges.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in wide, 1.20c. base net cash, 30 days. Following are stipulations prescribed by manufacturers, with extras:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated Feb. 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gage or weight to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras	Cents per lb.
Gages under ¼ in. to and including 3-16 in....	.10
Gages under 3-16 in. to and including No. 8....	.15
Gages under No. 8 to and including No. 9.....	.25
Gages under No. 9 to and including No. 10.....	.30
Gages under No. 10 to and including No. 12.....	.40
Sketches (including straight taper plates), 3 ft. and over	.10
Complete circles, 3 ft. in diameter and over....	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel.....	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive.....	.05
Widths over 110 in. up to 115 in., inclusive.....	.10
Widths over 115 in. up to 120 in., inclusive.....	.15
Widths over 120 in. up to 125 in., inclusive.....	.25
Widths over 125 in. up to 130 in., inclusive.....	.50
Widths over 130 in.....	1.00
Cutting to lengths under 3 ft. to 2 ft., inclusive.	.25
Cutting to lengths under 2 ft. to 1 ft., inclusive.	.50
Cutting to lengths under 1 ft.....	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Wire Products.—Prices to jobbers. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots, annealed, $1.35; galvanized, $2.15. Galvanized barb wire and staples, $2.40; painted, $1.60. Wire nails, $1.55. Galvanized nails, 1 in. and longer, $1.50 advance over base price; shorter than 1 in., $2 or more advance over base price. Woven wire fencing, 69 per cent off list for carloads; 68 off for 1000-rod lots; 67 off for less than 1000-rod lots.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12&12½	13	14	15	16
Annealed	$1.50	$1.55	$1.60	$1.65	$1.75	$1.85	$1.95	$2.05
Galvanized ...	2.30	2.35	2.40	2.45	2.55	2.65	2.95	3.05

Wire Rods.—Bessemer, open-hearth and chain rods, $25.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees, 3 in. and over, 1.20c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.....	.10
H-beams over 18 in.....	.10
Angles over 6 in., on one or both legs.....	.10
Angles, 3 in. on one or both legs less than ¼ in. thick, as per steel bar card, Sept. 1, 1909....	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail).....	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909.....	.20 to .80
Deck beams and bulb angles.....	.30
Handrail tees	.75
Cutting to lengths under 3 ft. to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.....	1.55

No charge for cutting to lengths 3 ft. and over.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect from June 17, 1915, all full weight:

Butt Weld

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
⅛, ¼ and ⅜....	72	40½	⅛ and ¼.....	64	31
½	76	53½	⅜	64	31
¾ to 3.....	79	57½	½	68	41
			¾ to 2½.....	71	46

Lap Weld

2	76	54½	1¼	55	30
2½ to 6.....	78	56½	1½	66	41
7 to 12.....	76	54½	2	67	43
13 and 14.....	62½	..	2½ to 4.....	69	46
15	60	..	4½ to 6.....	69	46
			7 to 12.....	67	46

Reamed and Drifted

1 to 3, butt.....	77	55½	1 to 1½, butt...	69	44
2, lap	74	52½	2, butt	69	44
2½ to 6, lap.....	76	54½	1¼, lap	53	28
			1½, lap	64	39
			2, lap	65	41
			2½ to 4, lap....	67	44

Butt Weld, extra strong, plain ends

¼, ⅜ and ⅜....	67	43½	⅜	61	37
½	72	52½	½	66	45
¾ to 1½.....	76	56½	¾ to 1½.....	70	47
2 to 3.....	77	57½	2 and 2½.....	71	48

Lap Weld, extra strong, plain ends

2	73	51½	1½	65	42
2½ to 4.....	75	53½	2	67	43
4½ to 6.....	74	52½	2½ to 4.....	69	46
7 to 8.....	68	46½	4½ to 6.....	68	45
9 to 12.....	63	41½	7 to 8.....	61	40
			9 to 12.....	56	35

Butt Weld, double extra strong, plain ends

½	62	42½	½	56	34
¾ to 1½.....	65	45½	¾ to 1½.....	59	37
2 to 2½.....	67	47½	2 and 2½.....	61	39

Lap Weld, double extra strong, plain ends

2	63	43½	2	57	34
2½ to 4.....	65	45½	2½ to 4.....	59	39
4½ to 6.....	64	44½	4½ to 6.....	58	38
7 to 8.....	58	36½	7 to 8.....	51	29

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts on less than carloads, f.o.b. Pittsburgh, freight to destination added, in effect from June 15, 1915, are as follows:

Lap Welded Steel		*Standard Charcoal Iron*	
1¾ and 2 in.....	64	1¾ and 2 in.....	51
2¼ in.	61	2¼ in.	48
2½ to 2¾ in.....	67	2½ and 2¾ in.....	55
3 and 3¼ in.....	72	3 and 3¼ in.....	59
3½ and 4½ in.....	73	3½ and 4½ in.....	61
5 and 6 in.....	66	5 and 6 in.....	55
7 to 13 in.....	63		

Locomotive and steamship special charcoal grades bring higher prices.

1¾ in., over 18 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

Sheets.—Makers' prices for mill shipment on sheets of U. S. Standard gage, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30

days net, or 2 per cent cash discount in 10 days from date of invoice:

Blue Annealed Sheets

	Cents per lb.
Nos. 3 to 8	1.25 to 1.30
Nos. 9 to 10	1.30 to 1.35
Nos. 11 and 12	1.35 to 1.40
Nos. 13 and 14	1.45 to 1.50
Nos. 15 and 16	1.55 to 1.60

Box Annealed Sheets, Cold Rolled

	Cents per lb.
Nos. 10 and 11	1.40 to 1.45
No. 12	1.40 to 1.45
Nos. 13 and 14	1.45 to 1.50
Nos. 15 and 16	1.50 to 1.55
Nos. 17 to 21	1.55 to 1.60
Nos. 22 and 24	1.60 to 1.65
Nos. 25 and 26	1.65 to 1.70
No. 27	1.70 to 1.75
No. 28	1.75 to 1.80
No. 29	1.80 to 1.85
No. 30	1.90 to 1.95

Galvanized Sheets of Black Sheet Gauge

	Cents per lb.
Nos. 10 and 11	3.50 to 4.00
No. 12	3.60 to 4.10
Nos. 13 and 14	3.60 to 4.10
Nos. 15 and 16	3.70 to 4.20
Nos. 17 to 21	3.85 to 4.35
Nos. 22 and 24	4.05 to 4.55
Nos. 25 and 26	4.20 to 4.70
No. 27	4.35 to 4.85
No. 28	4.50 to 5.00
No. 29	4.60 to 5.10
No. 30	4.75 to 5.25

Pittsburgh

PITTSBURGH, PA., June 29, 1915.

Leading steel companies state that orders being booked and specifications received are in excess of production. On some lines, notably steel bars, several of the larger makers are back in deliveries three to four weeks. One leading steel company reports that it is operating to about 80 per cent of capacity, while its orders and specifications are coming in at the rate of 100 per cent. It is the general belief that conditions among the steel mills in the last half of the year will be very active and that on some lines, notably steel bars and open-hearth billets and sheet bars, there will not be enough material to go around. The Carnegie Steel Company is expected to buy steel in the East before long to help out on its contracts. There is more inquiry for pig iron, and Bessemer is very firm with a probability that prices will be higher in the near future. The visible supply of Bessemer pig iron is limited. Basic is also in better demand, but the supply is larger and prices have improved very little. Foundries are taking pig iron more promptly, and while nearly all sellers ask $12.75, Valley furnace, for No. 2 for delivery over the remainder of the year, it can be bought for prompt delivery from two or three furnaces at $12.50. Cold-rolled strip steel has been advanced $2 per ton. Scrap and coke continue to lag and prices are not any better.

Pig Iron.—The market on Bessemer and basic iron is tightening. A local interest has just bought 10,000 tons of standard Bessemer, equal deliveries over the next six months at a price not disclosed. Furnaces in the valleys that ordinarily make Bessemer are either out of blast or are sold up and are declining to quote on large amounts so far ahead. The leading producer of Bessemer, the Shenango Furnace Company, reports that it has close to 90 per cent of its Bessemer iron sold, most of it going to the Valley Mold & Foundry Company, Sharpsville, Pa., to be made into ingot molds, while the steel works blast furnaces absolutely refuse to quote. The Colonial Steel Company has not yet closed on its inquiry for 10,000 tons of basic iron, but is expected to buy this week. There are other inquiries for 4000 to 5000 tons of Bessemer. The Union Steel Casting Company of this city has bought 1500 tons of Bessemer, equal monthly deliveries over last half of the year, at about $13.75, Valley furnace. We also note sales of about 2000 tons of No. 2 foundry iron for last half of the year delivery on the basis of $12.75, Valley furnace. We quote: Bessemer iron, $13.75; malleable Bessemer, $12.60 to $12.75; No. 2 foundry, $12.50 to $12.75; basic, $12.65 for July and August, and $12.75 to $12.80 for delivery over second half of the year; gray forge, $12.40 to $12.50, all at Valley furnace, with a freight rate of 95c. per ton for delivery in the Cleveland and Pittsburgh districts.

Billets and Sheet Bars.—The demand for open-hearth billets and sheet bars is greater than the supply. It is stated the Carnegie Steel Company is seriously considering the matter of buying some eastern open-hearth steel that would be shipped to its eastern customers, and diverting its own output to consumers in this market. If the heavy consumption keeps up, prices on open-hearth, and probably on Bessemer, are likely to be higher in the near future. The Sharon works of the Carnegie Steel Company is expected to start up this week. It will give the company close to 800 tons more of open-hearth steel per day. Its Columbus plant, having a high cost of production, may not start for some time. We quote: Bessemer and open-hearth billets, $19.50 to $20, and Bessemer and open-hearth sheet bars, $20.50 to $21, f.o.b. maker's mills, Youngstown; Bessemer and open-hearth billets, $21, and Bessemer and open-hearth sheet bars, $22, f.o.b. Pittsburgh. Forging billets are quoted at $27 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and lighter carbons. Forging billets running above 0.25 to 0.60 carbon take $1 per ton extra. Axle billets are held at $24.

Ferroalloys.—Local dealers report sales of four or five carloads of 80 per cent English ferromanganese from stock at about $105, delivered Pittsburgh. One consumer that had a fairly large inquiry out is reported to have bought about 100 tons for delivery in July and August at close to the above-named price. Consumers state they are getting fairly good deliveries, but there is still a possibility of a shortage in supply later on and the market is very firm. We quote English 80 per cent ferromanganese for prompt delivery from stock at $105, delivered Pittsburgh. We quote 50 per cent ferrosilicon in lots up to 100 tons, at $73; over 100 tons to 600 tons, $72; and over 600 tons, $71, delivered in the Pittsburgh district. We quote 10 per cent ferrosilicon at $17; 11 per cent, $18; 12 per cent, $19, all f.o.b. cars at furnace, Ashland, Ky., Jackson or New Straitsville, Ohio, each of these points having a rate to Pittsburgh of $2 per gross ton. We quote 20 per cent spiegeleisen at $25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads, 10c. in 2000-lb. lots and over, and 12½c. in smaller lots.

Structural Material.—New inquiry has been more active and some large jobs have been placed. The McClintic-Marshall Company has taken 13,500 tons for the Polk Street freight station of the Pennsylvania Lines West and 1000 tons for new steel buildings for the Aluminum Company of America at Edgewater, N. J. The American Bridge Company has taken 450 tons for a building for the experimental station of the Bureau of Mines in this city and is said to have taken 7500 tons of Government work at Pensacola, Fla., besides considerable foreign work. The Fort Pitt Bridge Works has taken about 2000 tons for new buildings for the Standard Tin Plate Company, Canonsburg, Pa., and the Jones & Laughlin Steel Company 2500 tons for new buildings for the McKeesport Tin Plate Company, McKeesport, Pa. At noon to-day (Tuesday) bids were opened at St. Louis for the municipal bridge which will take about 24,000 tons. The American Bridge Company was lowest bidder. The contract requires that all the fabricated steel for this bridge be delivered by July 1, 1916, and there is a penalty of $600 a day for failure to carry out this part of the contract. It is said one local interest has quoted 1.30c. on the material for this structure, naming this relatively higher price because deliveries on the material run over the next year. We quote beams and channels up to 15 in. for third quarter and last half of the year delivery at 1.25c., f.o.b. Pittsburgh. The market is reported firm at this price.

Plates.—The larger plate mills in this city report they are receiving inquiries from eastern shipyards for large quantities of plates for delivery in first half of next year, and this is regarded as a very favorable feature of the plate situation. No orders of moment for cars were placed the past week, but the Cincinnati, Hamilton & Dayton is expected to award 2000 freight

cars within a short time. These cars have been held up for some months until payment could be arranged for them. Current demand for plates is fairly heavy, and the Carnegie Steel Company is operating all its plate mills to 100 per cent of capacity, having a very large amount of orders on its books. Two local mills state they are holding plates firm at 1.25c. for ¼-in. and heavier for third quarter and last half of the year delivery, but on a desirable order some mills still name 1.20c. We therefore quote ¼-in. and heavier plates at 1.20c. to 1.25c., f.o.b. Pittsburgh.

Steel Rails.—The Edgar Thomson works of the Carnegie Company, which ordinarily makes rails only, is now turning out sheet bars, steel rails and steel rounds for shrapnel purposes. It is stated that several fairly large orders for standard sections and one order for light sections of 1200 tons for foreign delivery have lately been placed with a local mill through the United States Steel Products Company. The new demand for light rails is active, the Carnegie Company having taken about 2400 tons in new orders and specifications the past week. We quote standard section rails of Bessemer stock at 1.25c., and of open-hearth, 1.34c., f.o.b. Pittsburgh. We quote light rails as follows, in carload lots: 8 and 10 lb. sections, 1.275c.; 12 and 14 lb., 1.225c.; 16 and 20 lb., 1.175c.; 25, 30, 35, 40 and 45 lb. sections, 1.125c. The prices of light rails are materially shaded on large lots.

Tin Plate.—Conditions in this trade have been much improved by the heavy foreign demand. This comes mostly from England, France and Italy, one inquiry from France that came out last week being for 140,000 boxes. It is stated that some foreign buyers of tin plate have agreed to arrange to secure bottoms and to pay in New York funds. Several mills are refusing to quote on foreign orders, being filled for the next three or four weeks and not able to make deliveries wanted. It is stated that prices on foreign orders for tin plate range from about $3.05 to $3.25 or higher. The domestic demand is fairly good, but is mostly for small lots to piece out stocks of consumers that placed contracts some time ago. The four or five larger makers of tin plate are operating close to 100 per cent of capacity, and prices are firmer than for some time. On new orders we quote 14 x 20 coke plates at $3.10 to $3.25 per base box, but on a very desirable order for delivery ahead the $3.10 price might be shaded, but not over 10c. per box.

Sheets.—In June orders and shipments of sheet and tin-mill products of the American Sheet & Tin Plate Company have been the heaviest in any one month since February, 1913. As yet there has been no actual reduction in prices of galvanized sheets, despite the sharp decline in spelter, but the market is easier and No. 28 galvanized sheets can be had more freely at 5c., and some jobbers, who have good stocks are offering No. 28 at slightly less than 5c. A fair range of the market is 5c. to 5.50c., but the higher price is disappearing rapidly. The demand for Bessemer black and for blue annealed sheets is fairly good, and consumers are specifying freely against contracts. We quote No. 28 Bessemer black sheets at 1.75c. to 1.80c.; No. 28 galvanized, 5c. to 5.50c.; Nos. 9 and 10 blue annealed sheets, 1.30c. to 1.35c.; No. 30 black plate, tin-mill sizes, H. R. & A., 1.95c.; No. 28, 1.90c.; Nos. 27, 26 and 25, 1.85c.; Nos. 22 to 24, 1.80c.; Nos. 17 to 21, 1.75c.; Nos. 15 and 16, 1.70c. The above prices are for carload lots, f.o.b. at maker's mill, jobbers charging the usual advances for small lots from store.

Wire Rods.—Foreign inquiry is still heavy and local makers state they are turning down business nearly every day, being filled for some months ahead and not able to make deliveries wanted. As high as $26 has been paid for foreign rods, and one leading mill is refusing to quote on either domestic or foreign business. We quote Bessemer, open-hearth and chain rods at $25 to $26 for domestic, and $26 or higher is being asked by mills that can quote for foreign delivery.

Carwheels.—It is stated that the four concerns making steel carwheels are pretty well filled with orders for the next three or four months. We quote standard 33-in. freight carwheels 6¼ in. rough bore at $16, and standard 36-in. passenger, the same bore, at $22.50 per wheel, f.o.b. Pittsburgh.

Shafting.—Demand continues heavy and makers of shafting are operating to 100 per cent. and are getting behind in deliveries. The Jones & Laughlin Steel Company has notified its sales agents not to accept any orders after July 1 at less than 66 per cent. off, and to quote only when necessary, referring as many inquiries as possible to the home office. Nearly all the large consumers of shafting, such as the automobile builders, screw stock machine concerns and implement makers, have covered for third quarter and last half of the year at discounts ranging from 68 to 70 per cent off. All the makers are now quoting 66 per cent off in carload and larger lots and 61 per cent off in less than carloads, f.o.b. Pittsburgh.

Railroad Spikes.—The New York Central is inquiring for 30,000 kegs or more for its various lines, the Baltimore & Ohio 20,000, the Wheeling & Lake Erie 1000 and the Lehigh & New England 2000. It is stated that on all these inquiries makers are quoting $1.40 and holding firm. We quote standard sizes of railroad spikes at $1.40 and small railroad and boat spikes at $1.50 per 100 lb., f.o.b. Pittsburgh.

Hoops and Bands.—Nearly all consumers of hoops and bands are covered for third quarter and some into last half of the year. Local makers are quoting 1.25c. on bands and 1.30c. on hoops, and state they are refusing to go lower. The Sharon Steel Hoop Company reports it is operating to 100 per cent, and its output of hoops and bands is sold for some months ahead. We quote steel bands at 1.25c. for delivery in third quarter and last half, with extras as per the steel bar card, and steel hoops at 1.30c., f.o.b. Pittsburgh.

Wire Products.—The domestic demand for wire and wire nails is mostly for small lots, but specifications against contracts are still coming in quite freely. The foreign demand is heavy, and a very large amount of wire nails is being shipped abroad by local mills. This is also true of barb wire, local makers stating they have foreign inquiries nearly every day, on most of which they do not quote, being unable to make the deliveries wanted. The full differential of 80c. on galvanized products is still being maintained. Local wire mills are pretty well filled up with foreign and domestic business over remainder of this year and prices are firm. To jobbers on new orders the mills quote wire nails, $1.55; galvanized nails, 1 in. and longer taking an advance over this price of $1.50, and shorter than 1 in., $2 or more. Plain annealed wire is $1.35 to $1.40; galvanized barb wire and fence staples, $2.40; painted barb wire, $1.60; all f.o.b. Pittsburgh, with freight added to point of delivery, terms 30 days net, less 2 per cent off for cash in 10 days. Prices on woven wire fencing are higher, and it is now quoted at 69 per cent off in carload lots, 68 per cent on 1000-rod lots, and 67 per cent on small lots, f.o.b. Pittsburgh.

Skelp.—The market is more active, and local mills that roll skelp are filled for some time ahead. Prices are firm, and if the demand keeps up will likely be higher in the near future. We quote grooved steel skelp at 1.15c. to 1.20c.; sheared steel skelp, 1.20c. to 1.25c.; grooved iron skelp, 1.60c. to 1.65c., and sheared iron skelp, 1.70c. to 1.75c., delivered to consumers' mills in the Pittsburgh district. The minimum prices quoted above would be named only on very desirable orders and for regular sizes.

Iron and Steel Bars.—The market on steel bars is more active and prices are firmer than probably on any of the other hot-rolled products. Nearly all the implement makers and other large consumers have covered for last half of this year and in some cases for first half of next year, and mills report that specifications are already coming in freely. The enormous demand for rounds for shrapnel has filled the steel-bar mills and some are back in deliveries three to four weeks. Local steel-bar mills are operating to capacity, turning out every pound of product they can. All the leading steel-bar makers are now quoting 1.25c. for third quarter, and there is some talk of putting the price for fourth quarter to 1.30c. in a short time. The new demand for iron bars is a little better, but is not yet large enough

days net, or 2 per cent cash discount in 10 days from date of invoice:

Blue Annealed Sheets

	Cents per lb.
Nos. 3 to 8	1.25 to 1.30
Nos. 9 to 10	1.30 to 1.35
Nos. 11 and 12	1.35 to 1.40
Nos. 13 and 14	1.45 to 1.50
Nos. 15 and 16	1.55 to 1.60

Box Annealed Sheets, Cold Rolled

	Cents per lb.
Nos. 10 and 11	1.40 to 1.45
No. 12	1.40 to 1.45
Nos. 13 and 14	1.45 to 1.50
Nos. 15 and 16	1.50 to 1.55
Nos. 17 to 21	1.55 to 1.60
Nos. 22 and 24	1.60 to 1.65
Nos. 25 and 26	1.65 to 1.70
No. 27	1.70 to 1.75
No. 28	1.75 to 1.80
No. 29	1.80 to 1.85
No. 30	1.90 to 1.95

Galvanized Sheets of Black Sheet Gauge

	Cents per lb.
Nos. 10 and 11	3.50 to 4.00
No. 12	3.60 to 4.10
Nos. 13 and 14	3.60 to 4.10
Nos. 15 and 16	3.70 to 4.20
Nos. 17 to 21	3.85 to 4.35
Nos. 22 and 24	4.05 to 4.55
Nos. 25 and 26	4.20 to 4.70
No. 27	4.35 to 4.85
No. 28	4.50 to 5.00
No. 29	4.60 to 5.10
No. 30	4.75 to 5.25

Pittsburgh

PITTSBURGH, PA., June 29, 1915.

Leading steel companies state that orders being booked and specifications received are in excess of production. On some lines, notably steel bars, several of the larger makers are back in deliveries three to four weeks. One leading steel company reports that it is operating to about 80 per cent of capacity, while its orders and specifications are coming in at the rate of 100 per cent. It is the general belief that conditions among the steel mills in the last half of the year will be very active and that on some lines, notably steel bars and open-hearth billets and sheet bars, there will not be enough material to go around. The Carnegie Steel Company is expected to buy steel in the East before long to help out on its contracts. There is more inquiry for pig iron, and Bessemer is very firm with a probability that prices will be higher in the near future. The visible supply of Bessemer pig iron is limited. Basic is also in better demand, but the supply is larger and prices have improved very little. Foundries are taking pig iron more promptly, and while nearly all sellers ask $12.75, Valley furnace, for No. 2 for delivery over the remainder of the year, it can be bought for prompt delivery from two or three furnaces at $12.50. Cold-rolled strip steel has been advanced $2 per ton. Scrap and coke continue to lag and prices are not any better.

Pig Iron.—The market on Bessemer and basic iron is tightening. A local interest has just bought 10,000 tons of standard Bessemer, equal deliveries over the next six months at a price not disclosed. Furnaces in the valleys that ordinarily make Bessemer are either out of blast or are sold up and are declining to quote on large amounts so far ahead. The leading producer of Bessemer, the Shenango Furnace Company, reports that it has close to 90 per cent of its Bessemer iron sold, most of it going to the Valley Mold & Foundry Company, Sharpsville, Pa., to be made into ingot molds, while the steel works blast furnaces absolutely refuse to quote. The Colonial Steel Company has not yet closed on its inquiry for 10,000 tons of basic iron, but is expected to buy this week. There are other inquiries for 4000 to 5000 tons of Bessemer. The Union Steel Casting Company of this city has bought 1500 tons of Bessemer, equal monthly deliveries over last half of the year, at about $13.75, Valley furnace. We also note sales of about 2000 tons of No. 2 foundry iron for last half of the year delivery on the basis of $12.75, Valley furnace. We quote: Bessemer iron, $13.75; malleable Bessemer, $12.60 to $12.75; No. 2 foundry, $12.50 to $12.75; basic, $12.65 for July and August, and $12.75 to $12.80 for delivery over second half of the year; gray forge, $12.40 to $12.50, all at Valley furnace, with a freight rate of 95c. per ton for delivery in the Cleveland and Pittsburgh districts.

Billets and Sheet Bars.—The demand for open-hearth billets and sheet bars is greater than the supply. It is stated the Carnegie Steel Company is seriously considering the matter of buying some eastern open-hearth steel that would be shipped to its eastern customers, and diverting its own output to consumers in this market. If the heavy consumption keeps up, prices on open-hearth, and probably on Bessemer, are likely to be higher in the near future. The Sharon works of the Carnegie Steel Company is expected to start up this week. It will give the company close to 800 tons more of open-hearth steel per day. Its Columbus plant, having a high cost of production, may not start for some time. We quote: Bessemer and open-hearth billets, $19.50 to $20, and Bessemer and open-hearth sheet bars, $20.50 to $21, f.o.b. maker's mills, Youngstown; Bessemer and open-hearth billets, $21, and Bessemer and open-hearth sheet bars, $22, f.o.b. Pittsburgh. Forging billets are quoted at $27 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and lighter carbons. Forging billets running above 0.25 to 0.60 carbon take $1 per ton extra. Axle billets are held at $24.

Ferroalloys.—Local dealers report sales of four or five carloads of 80 per cent English ferromanganese from stock at about $105, delivered Pittsburgh. One consumer that had a fairly large inquiry out is reported to have bought about 100 tons for delivery in July and August at close to the above-named price. Consumers state they are getting fairly good deliveries, but there is still a possibility of a shortage in supply later on and the market is very firm. We quote English 80 per cent ferromanganese for prompt delivery from stock at $105, delivered Pittsburgh. We quote 50 per cent ferrosilicon in lots up to 100 tons, at $73; over 100 tons to 600 tons, $72; and over 600 tons, $71, delivered in the Pittsburgh district. We quote 10 per cent ferrosilicon at $17; 11 per cent, $18; 12 per cent, $19, all f.o.b. cars at furnace, Ashland, Ky., Jackson or New Straitsville, Ohio, each of these points having a rate to Pittsburgh of $2 per gross ton. We quote 20 per cent spiegeleisen at $25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads, 10c. in 2000-lb. lots and over, and 12½c. in smaller lots.

Structural Material.—New inquiry has been more active and some large jobs have been placed. The McClintic-Marshall Company has taken 13,500 tons for the Polk Street freight station of the Pennsylvania Lines West and 1000 tons for new steel buildings for the Aluminum Company of America at Edgewater, N. J. The American Bridge Company has taken 450 tons for a building for the experimental station of the Bureau of Mines in this city and is said to have taken 7500 tons of Government work at Pensacola, Fla., besides considerable foreign work. The Fort Pitt Bridge Works has taken about 2000 tons for new buildings for the Standard Tin Plate Company, Canonsburg, Pa., and the Jones & Laughlin Steel Company 2500 tons for new buildings for the McKeesport Tin Plate Company, McKeesport, Pa. At noon to-day (Tuesday) bids were opened at St. Louis for the municipal bridge which will take about 24,000 tons. The American Bridge Company was lowest bidder. The contract requires that all the fabricated steel for this bridge be delivered by July 1, 1916, and there is a penalty of $600 a day for failure to carry out this part of the contract. It is said one local interest has quoted 1.30c. on the material for this structure, naming this relatively higher price because deliveries on the material run over the next year. We quote beams and channels up to 15 in. for third quarter and last half of the year delivery at 1.25c., f.o.b. Pittsburgh. The market is reported firm at this price.

Plates.—The larger plate mills in this city report they are receiving inquiries from eastern shipyards for large quantities of plates for delivery in first half of next year, and this is regarded as a very favorable feature of the plate situation. No orders of moment for cars were placed the past week, but the Cincinnati, Hamilton & Dayton is expected to award 2000 freight

cars within a short time. These cars have been held up for some months until payment could be arranged for them. Current demand for plates is fairly heavy, and the Carnegie Steel Company is operating all its plate mills to 100 per cent of capacity, having a very large amount of orders on its books. Two local mills state they are holding plates firm at 1.25c. for ¼-in. and heavier for third quarter and last half of the year delivery, but on a desirable order some mills still name 1.20c. We therefore quote ¼-in. and heavier plates at 1.20c. to 1.25c., f.o.b. Pittsburgh.

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Wire Products.—The domestic demand for wire and wire nails is mostly for small lots, but specifications against contracts are still coming in quite freely. The foreign demand is heavy, and a very large amount of wire nails is being shipped abroad by local mills. This is also true of barb wire, local makers stating they have foreign inquiries nearly every day, on most of which they do not quote, being unable to make the deliveries wanted. The full differential of 80c. on galvanized products is still being maintained. Local wire mills are pretty well filled up with foreign and domestic business over remainder of this year and prices are firm. To jobbers on new orders the mills quote wire nails, $1.55; galvanized nails, 1 in. and longer taking an advance over this price of $1.50, and shorter than 1 in., $2 or more. Plain annealed wire is $1.35 to $1.40; galvanized barb wire and fence staples, $2.40; painted barb wire, $1.60; all f.o.b. Pittsburgh, with freight added to point of delivery; terms 30 days net, less 2 per cent off for cash in 10 days. Prices on woven wire fencing are higher, and it is now quoted at 69 per cent off in carload lots, 68 per cent on 1000-rod lots, and 67 per cent on small lots, f.o.b. Pittsburgh.

Skelp.—The market is more active, and local mills that roll skelp are filled for some time ahead. Prices are firm, and if the demand keeps up will likely be higher in the near future. We quote grooved steel skelp at 1.15c. to 1.20c.; sheared steel skelp, 1.20c. to 1.25c.; grooved iron skelp, 1.60c. to 1.65c., and sheared iron skelp, 1.70c. to 1.75c., delivered to consumers' mills in the Pittsburgh district. The minimum prices quoted above would be named only on very desirable orders and for regular sizes.

Iron and Steel Bars.—The market on steel bars is more active and prices are firmer than probably on any of the other hot-rolled products. Nearly all the implement makers and other large consumers have covered for last half of this year and in some cases for first half of next year, and mills report that specifications are already coming in freely. The enormous demand for rounds for shrapnel has filled the steel-bar mills and some are back in deliveries three to four weeks. Local steel-bar mills are operating to capacity, turning out every pound of product they can. All the leading steel-bar makers are now quoting 1.25c. for third quarter, and there is some talk of putting the price for fourth quarter to 1.30c. in a short time. The new demand for iron bars is a little better, but is not yet large enough

to give the mills work to run full, and they are operating to only 65 to 75 per cent of capacity. We quote steel bars at 1.25c. for third quarter; common iron bars made from part scrap, 1.25c. to 1.30c., and test-iron bars at 1.35c. to 1.40c., f.o.b. Pittsburgh.

Rivets.—Makers report the new demand for boiler and structural rivets as active, and more orders are being placed than at any time in more than a year. Some of the rivet shops that have done very little for a long time and are now running to 75 per cent or more of capacity. Prices are firm, and if the demand keeps up will likely be higher. We quote structural rivets at $1.50, and conehead boiler rivets at $1.60 per 100 lb. in carload lots, f.o.b. Pittsburgh, smaller lots bringing from 5c. to 10c. advance, depending on the order.

Cold-Rolled Strip Steel.—On account of the heavy demand and the higher prices for raw materials the base price on cold-rolled strip steel has been advanced 10c. per 100 lb., or to $2.85. It is stated that most large consumers have covered for third quarter and last half of the year at $2.75 base, but on current orders all the makers are now quoting $2.85 base. We quote hand-rolled steel, 1½ in. and wider, under 0.20 carbon, sheared or natural mill edge, per 100 lb., $2.85, delivered. Extras, which are standard among all the mills, are as follows:

Thickness, in.	Extras for thickness	Extras for soft or intermediate tempers	Extras for straightening and cutting to lengths not less than 24 in.
0.100 and heavier	Base	$0.25	$0.10
0.099 to 0.050	$0.05	0.25	0.15
0.049 to 0.035	0.20	0.25	0.15
0.034 to 0.031	0.35	0.40	0.25
0.030 to 0.025	0.45	0.40	0.40
0.024 to 0.020	0.55	0.40	0.50
0.019 to 0.017	0.85	0.50	1.10
0.016 to 0.015	1.25	0.50	1.10
0.014 to 0.013	1.95	0.50	1.25
0.012	2.30	0.50	coils only
0.011	2.65	0.50	coils only
0.010	3.00	0.50	coils only

Merchant Steel.—The new demand is more active, and specifications are coming in more freely than for a long time. Shipments by two leading makers in June were the heaviest in any one month for more than a year. Prices are firm and in small lots are as follows: Iron finished tire, ½ x 1½ in. and larger, 1.40c., base; under ½ x 1½ in., 1.55c.; planished tire, 1.60c.; channel tire, ¾ to ⅞ and 1 in., 1.90c. to 2c.; 1⅛ in. and larger, 2c.; toe calk, 2c. to 2.10c., base; flat sleigh shoe, 1.75c.; concave and convex, 1.80c.; cutter shoe, tapered or bent, 2.30c. to 2.40c.; spring steel, 2c. to 2.10c.; machinery steel, smooth finish, 1.80c.

Nuts and Bolts.—Makers report shipments heavier, with the new demand more active. Most large consumers are covered over second half of the year and are specifying freely against their orders. Prices are stated to be firm, discounts to the large trade being as follows:

U. S. S. Cold Punched Blank and Tapped, Chamfered, Trimmed and Reamed

½ in. and smaller, hex.....8.1c. per lb. off
⅝ in. and larger, hex.....7.3c. per lb. off
Square, all sizes .....5.8c. per lb. off

Semi-Finished Tapped

½ in. and smaller hex.....85-10-10-10 off
⅝ in. and larger hex.....85-10-10 off

Black Bulk Rivets

7/16 x 6½, smaller and shorter.....80-10-5 off

Package Rivets 1000 Pcs.

Black, metallic tinned and tin plated....75-10-10 off

Discounts on bolts as recently adopted are as follows:

Common carriage bolts, ⅜ x 6, S & S rolled, 80-5; cut, 80; larger or longer, 75-5. Machine bolts, h. p. nuts, ⅜ x 4, S & S rolled, 80-5; cut, 80; larger or longer, 75-2/10. Machine bolts with C. P. & C & T nuts, ⅜ x 4, S & S, 75-2/10; larger or longer, 75. Bolts without nuts, 6 in. and shorter extra 10%; longer lengths, extra 5%. G. P. coach screws, 75-2/10-5. Nuts, blank or tapped, h. p. square, 6.20; hexagon, 7.10. C. P. C & T square, 5.80; hex. ⅝ in. and up, 7.30; smaller, 8.1. C. P. plain, square, 5.30; hexagon, 5.70. C. P., semi-fin. hex., ⅝ and up, 85-3/10; smaller, 85-2/10.

Wrought Pipe.—The demand for tubular goods in June, especially for the smaller sizes of merchant iron and steel pipe, was slightly better than in May. One mill reports that on small sizes of pipe it is sold up from two to three months ahead. A local mill is reported to have taken an order for 60 to 65 miles of 8 and 10 in. line pipe. The mills are now operating to about 80 per cent or better of capacity.

Boiler Tubes.—The new demand for locomotive and merchant tubes in June was heavier than in May, one mill reporting that it booked nearly double as much business in June as in any other month in more than a year. Discounts on iron and steel boiler tubes are reported firm.

Old Material.—The local situation in scrap has quieted down, largely for the reason that four heavy consumers, that have been buying rather freely recently, now report they are well stocked and are refusing to take in any more until their yards are cleared up to some extent. Recently selected heavy steel scrap sold as high as $12.50, delivered at Monessen, Pa., but this price could not be obtained to-day. Prices on borings, turnings and compressed side and end sheet scrap are firm and higher. Some dealers are not anxious to sell at present, believing that prices are bound to be higher in the near future. For delivery in Pittsburgh and nearby districts that take Pittsburgh freights, dealers quote about as follows:

Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	$11.75 to $12.00
Compressed side and end sheet scrap.	11.75 to 12.00
No. 1 foundry cast	12.25 to 12.50
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	9.25 to 9.50
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	11.75 to 12.00
No. 1 railroad malleable stock	10.50 to 10.75
Railroad grate bars	8.50 to 8.75
Low phosphorus melting stock	15.25 to 15.50
Iron car axles	18.75 to 19.25
Steel car axles	13.25 to 13.75
Locomotive axles, steel	19.75 to 20.25
No. 1 busheling scrap	10.25 to 10.50
No. 2 busheling scrap	7.25 to 7.50
Machine shop turnings	8.25 to 8.50
Old carwheels	11.75 to 12.00
Cast-iron borings	8.75 to 9.00
*Sheet bar crop ends	12.00 to 12.25
Old iron rails	12.75 to 13.00
No. 1 railroad wrought scrap	10.75 to 11.00
Heavy steel axle turnings	8.50 to 8.75
Heavy breakable cast scrap	10.75 to 11.00

*Shipping point.

Coke.—The local market is quiet. Coke has not yet responded either in demand or price to the general betterment in the steel trade. The production is much heavier, but it is largely with those making coke for steel works blast furnaces, the demand for furnace coke from merchant furnaces being dull. This week the H. C. Frick Coke Company is starting up about 400 more ovens, among the plants to be started being Hecla No. 3, which has been idle for about six months. We quote best grades of blast furnace coke at $1.55 to $1.60 for prompt shipment, and $1.70 to $1.75 per net ton at oven for delivery over remainder of the year. We quote best makes of 72-hr. foundry coke for prompt shipment at $2 to $2.25, and on contracts from $2.25 to $2.50, per net ton at oven. The *Connellsville Courier* gives the output of coke in the upper and lower Connellsville regions for the week ended June 19, as 348,510 net tons, an increase over the previous week of 13,996 tons.

Chicago

CHICAGO, ILL., June 30, 1915.—(*By Wire.*)

The approach to a normal and profitable operation of the steel mills is being rapidly accelerated. An estimate of last week's local bookings of steel, for early delivery would not fall short of 75,000 tons. The apportionment of Pennsylvania rails and fastenings was received, including 32,000 tons of rails, 6300 tons of tie plates and 2400 tons of angle bars. Orders were placed for 12,000 tons of steel for the new Pennsylvania freight terminal and 5400 tons for the Burlington's bridge at Kansas City. Another Kansas City bridge brought 1100 tons, while additional orders of structural steel for buildings and bridges called for 2500 tons. Of less individual prominence, but important in the aggregate, were some 3500 tons for export to Canada and Great Britain together with a total of specifications covering shapes, bars and plates from car builders, bridge shops and the general run of manufacturers in which all of the mills participated. For early placing, the 24,000 tons for the St. Louis bridge and 20,000 tons for 1000 Northwestern and 2000 Burlington cars are an immediate prospect. From the standpoint of tonnage, shapes, plates and bars are almost equally

productive and semi-finished steel in the form of sheet bars, billets and wire rods is absorbing a fair proportion of steel making capacity, particularly in the operations of the leading interest, while of the more highly finished products, spikes and track bolts are being specified freely. Sheets alone are conspicuously neglected and for this the reason is readily recognized. At the same time the mills at Indiana Harbor, having large sheet capacity, are taking the output of eleven out of twelve open-hearth furnaces for remaining products. The level of average prices is advancing with tonnage. For structural steel and bars the price of material now being rolled is from 1.25c., Chicago, to 1.339c. Rollings in the coming quarter will be largely on the basis of 1.339c. and 1.389c., while for fourth quarter only a minor portion of the total tonnage will yield less than 1.439c. Plate prices have moved up more slowly, the market for third quarter bookings being still at 1.339c. and lower. In other directions improvement is almost entirely lacking. June will prove to have been an exceedingly light month for the bar-iron mills, although some satisfaction is obtainable from the firmness of prices. Pig iron, considering the low level of prices, presents an unsatisfactory condition, but old material values have this week moved up a peg.

Pig Iron.—Transactions in Southern iron and in Northern iron of Southern analysis have been the comparatively prominent features of the week. The iron placed in the South is reported as having brought $9.75, Birmingham, but competitive iron from local furnaces appears to have been sold at prices calculated to take the business. Expected sales of malleable iron have been realized in several instances, although the aggregate quantity purchased will not greatly exceed 5000 tons. At South Bend, Ind., a plow manufacturer, whose annual purchases of charcoal iron are among the most important of the year, is in the market. Charcoal iron quotations, while generally maintained on the basis of the minimum furnace price of $14, show some lack of uniformity in the differentials for the several grades. To what extent this may or may not represent weakness in the market will doubtless appear in the outcome of pending transactions. Demand for Northern foundry iron is limited but prices are firm at $13 at furnace. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. a ton:

Lake Superior charcoal, Nos. 2 to 5	$15.75
Lake Superior charcoal, No. 1	16.25
Lake Superior charcoal, No. 6 and Scotch	16.75
Northern coke foundry, No. 1	$13.50 to 13.75
Northern coke foundry, No. 2	13.00 to 13.50
Northern coke foundry, No. 3	12.50 to 13.00
Southern coke, No. 1 f'dry and 1 soft	14.25 to 14.50
Southern coke, No. 2 f'dry and 2 soft	13.75 to 14.00
Malleable Bessemer	13.00 to 13.25
Standard Bessemer	16.50
Basic	12.50 to 13.00
Low phosphorus	20.00 to 20.50
Jackson Co. and Ky. silvery, 8 per cent.	16.50 to 17.00
Jackson Co. and Ky. silv'y, 10 per cent.	17.50 to 18.00

(*By Mail*)

Rails and Track Supplies.—A feature of the very heavy specifications taken by the leading interest last week was the allotment of Pennsylvania rails, amounting to approximately 32,000 tons, accompanied by some 6300 tons of tie plates and about 2400 tons of angle bars. Other specifications for track fastenings, tie plates and continuous joints have been heavy. We quote standard railroad spikes at 1.50c., base; track bolts with square nuts, 1.90c., base, all in carload lots, Chicago; tie plates, $23.25 to $24.25, f.o.b. mill, net ton; standard section Bessemer rails, Chicago, 1.25c., base, open-hearth, 1.34c.; light rails, 25 to 45 lb., 1.07c.; 16 to 20 lb., 1.12c.; 12 lb., 1.17c.; 8 lb., 1.22c.; angle bars, 1.50c., Chicago.

Structural Material.—Structural business has been coming in freely from all directions. Among the most important orders placed are the 12,000 tons for the Pennsylvania freight terminal at Chicago, awarded to the McClintic-Marshall Company, the steel to be furnished by the Jones & Laughlin Steel Company; 5400 tons for the Hannibal bridge at Kansas City, awarded by the Burlington Railroad to the American Bridge Company, and 1100 tons, taken by the same fabricator, for the Eighteenth Street viaduct at Kansas City. Bids were taken Tuesday on the 24,000 tons for the approach to the Free Bridge at St. Louis. The American Bridge Company was the leading factor in the taking of other contracts last week, being credited with four orders for an aggregate of 1125 tons, including 375 tons for a Santa Fe elevator at Argentina, Kan., 315 tons for the Montreal Mining Company, Hurley, Wis., and 304 tons for a bridge in Humboldt County, Cal. The contract for the Security Mutual Life Building, Lincoln, Neb., involving 475 tons, has been placed, and A. Bolters' Sons will furnish 175 tons for a high school building at Ottawa, Ill. The King Bridge Company is reported to have taken the order for about 500 tons for new buildings for the University of Illinois. To the inquiry for 1000 cars put out by the Omaha road, which is still open, has been added the Burlington's inquiry for 2000 box cars. The only barren spots in the comparative harvest of structural tonnage now being reaped are the local fabricating shops whose activity is largely curtailed by the strike in the building trade. The market is rapidly increasing in firmness, some of the mills asking 1.25c., Pittsburgh, for all forward business, but for the most part third quarter contracts have been taken at 1.20c. and fourth quarter only, at 1.25c. For small lots of structural material up to 100 tons, for immediate shipment, even more favorable prices have been obtained. We quote for Chicago delivery of structural steel from mill 1.389c.

Structural shapes are moving only slowly from local stocks and we continue to quote for store delivery 1.75c.

Plates.—The remaining traces of weakness in the plate situation appear to be largely due to quotations from small mills outside of this territory. For immediate shipment plates can be had, it is stated, at 1.10c., Pittsburgh, but for third quarter contracts, 1.15c. is the general minimum, while no small tonnage has been booked at 1.20c. The improvement in the plate situation as regards mill operations, while due in large measure to the booking of car and bridge girder-plates, has also benefited from a substantial increase in the demand for general purposes. We quote for Chicago delivery of plates from mill 1.339c.

We quote for Chicago delivery of plates out of stock 1.75c.

Sheets.—There have been no new developments in the sheet situation. The evidence of abnormal conditions affecting galvanized sheets is accentuated by the fact that this product, which normally responds in volume of business most readily with an upturn in the market, is now the least active of the finished steel lines. There is little prospect for change in this respect, as the leading makers are unlikely to resume a campaign for business until spelter again drops to a safe level. We quote for Chicago delivery from mill: No. 10 blue annealed, 1.489c.; No. 28 black, 1.939c.; No. 28 galvanized, 5.15c. to 5.439c.

Buying of galvanized sheets from store is testing stocks to a maximum. We quote for Chicago delivery from jobbers' stocks as follows, minimum prices applying on bundles of 25 or more: No. 10 blue annealed, 1.95c.; No. 28 black, 2.55c.; No. 28 galvanized, 4.85c.

Bars.—Although there is a great deal of inquiry in this market for bars for ammunition purposes and for export, but little has been booked by local mills, aside from orders taken by the leading interest for shipment to Canada and Great Britain. Of such business about 1000 tons for Great Britain was booked last week and about 2000 tons for Canada. The very substantial commitments which are now engaging the local mills practically to capacity are accordingly a good indication of the improvement in domestic demand. Bar iron tonnage is singularly lacking. The month of June will probably show the lightest bookings for that month in a number of years, and the operations of local mills have been considerably under 50 per cent of their possible capacity. We quote for mill shipment as follows:

Bar iron, 1.20c.; soft steel bars, 1.389c.; hard steel bars, 1.20c.; shafting, in carloads, 65 to 68 per cent off; less than carloads, 60 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 1.65c.; bar iron, 1.65c.; reinforcing bars, 1.65c., base, with 5c. extra for twisting in sizes ½ in. and over and usual card extras for smaller sizes; shafting 60 per cent off, and in carloads, 62 per cent off.

Rivets and Bolts.—Contracting for rivets has been accomplished with a very general adherence to the recently established higher level of prices, and a fair amount of business has been placed. The exceptionally large inquiry for bolts and nuts from the New York Central is the feature in that line although other inquiry is reported as generally improved. Quotations are as follows: Carriage bolts up to ⅜ x 6 in., rolled thread, 80-10; cut thread, 80-5; larger sizes, 75-15; machine bolts up to ⅜ x 4 in., rolled thread, with hot pressed square nuts, 80-15; cut thread, 80-10; larger sizes, 80; gimlet point coach screws, 85; hot pressed nuts, square, $6.40 off per cwt.; hexagon, $7.30 off per cwt. Structural rivets, ¾ to 1¼ in., 1.65c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 2c.; boiler rivets, 2.10c.; machine bolts up to ⅜ x 4 in., 75-15; larger sizes, 70-10-10; carriage bolts up to ⅜ x 6 in., 75-10; larger sizes, 70-15 off; hot pressed nuts, square, $6, and hexagon, $6.70 off per cwt.

Wire Products.—Among the independent makers of wire the situation is reported as showing a decided tendency to tighten. Some of the mills which have been sellers of semi-finished materials, including wire rods, are well sold up and are quoting with some show of reluctance. A firm position is also being taken with respect to wire nails and, naturally, to galvanized wire products. We quote to jobbers as follows: Plain wire, No. 9 and coarser, base, $1.589; wire nails, $1.739; painted barb wire, $1.789; galvanized barb wire, $2.539; polished staples, $1.789; galvanized staples, $2.539, all Chicago.

Old Material.—Purchases of a number of grades of foundry scrap, made in the past week, established the fact that the firm tendencies recently apparent have accomplished actual advances in prices. Our quotations have been revised accordingly. Steel scrap also has been similarly affected, although the evidence is largely based upon sales to consumers outside of this immediate territory. Purchases of heavy melting steel at Ohio points indicate a minimum value in the Chicago switching district of $9.75, with $10 the asking price. Sales of frogs, switches and guards reflect an even stronger position. The lack of demand for rolling-mill grades is so conspicuous as to make similar advances on these items difficult. New offerings of railroad scrap are limited and include 1800 tons from the Chicago & Northwestern, 600 tons from the Chicago & Alton and a list from the Baltimore & Ohio. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

	Per Gross Ton	
Old iron rails	$12.25 to	$12.50
Old steel rails, rerolling	10.25 to	10.75
Old steel rails, less than 3 ft.	10.00 to	10.50
Relaying rails	19.50 to	20.50
Old carwheels	10.75 to	11.00
Heavy melting steel scrap	9.75 to	10.00
Frogs, switches and guards, cut apart	10.00 to	10.25
Shoveling steel	9.25 to	9.75
Steel axle turnings	7.25 to	7.50
	Per Net Ton	
Iron angles and splice bars	$11.75 to	$12.25
Iron arch bars and transoms	12.00 to	12.50
Steel angle bars	8.75 to	9.00
Iron car axles	13.50 to	14.00
Steel car axles	10.00 to	10.50
No. 1 railroad wrought	9.00 to	9.25
No. 2 railroad wrought	8.50 to	8.75
Cut forge	8.50 to	8.75
Steel knuckles and couplers	8.75 to	9.00
Steel springs	9.25 to	9.50
Locomotive tires, smooth	8.75 to	9.25
Machine shop turnings	5.00 to	5.50
Cast borings	5.00 to	5.50
No. 1 busheling	7.25 to	7.50
No. 2 busheling	6.00 to	6.50
No. 1 boilers, cut to sheets and rings	5.50 to	6.00
Boiler punchings	8.25 to	8.50
No. 1 cast scrap	9.00 to	9.50
Stove plate and light cast scrap	8.25 to	8.50
Grate bars	7.50 to	7.75
Railroad malleable	8.75 to	9.25
Agricultural malleable	8.00 to	8.50
Pipes and flues	6.25 to	6.75

Cast-Iron Pipe.—The leading interest has been awarded the contract for 2600 tons of pipe at St. Louis, this being the only contract of importance placed during the week. Of prospective lettings the inquiry for 3500 tons for Covington, Ky., upon which figures will be taken July 8, is the most important. At Rittman, Ohio, a letting is scheduled involving 700 tons. We quote as follows, per net ton, Chicago: Water pipe, 4 in., $26; 6 to 12 in., $24; 16 in. and up, $23.50, with $1 extra for Class A water pipe and gas pipe.

Philadelphia

PHILADELPHIA, PA., June 29, 1915.

The demand for finished and semi-finished steel products continues to improve and is spreading optimism in other directions. A particularly pleasing feature of the betterment is that, while war business continues the prominent factor it has been, the diversity of products now called for indicates a waking-up of industrial consumers whom the war purchasing has affected only indirectly, if at all. One large steel company is so impressed by conditions that it has ordered its branch representatives to withdraw all outstanding quotations. It finds a general effort on the part of consumers to get under cover by contracting at present prices. It is quoting 1.409c., Philadelphia, on bars, plates and shapes. Only in a few instances can 1.359c. be done, and that only on immediate deliveries. Billet specifications are active, and some attractive new business has been done. Bar specifications have been good, and sales of and inquiries for shrapnel steel are reported. In plates the week has been a busy one. Structural shapes continue to make a poor showing. Pig iron, more particularly the foundry grades, continues to lag, but the trade is hopeful. Producers of standard low phosphorus iron have taken a firm stand on prices and are not eager for business at existing prices. In old material more interest is being shown by consumers, and prices are stronger.

Iron Ore.—Arrivals at this port in the week ended June 26 consisted of 7370 tons from Chili and 5100 tons from Cuba.

Pig Iron.—The demand for foundry iron shows but little improvement, but general conditions are better and the trade is sanguine that a turn is not far off. The Baldwin Locomotive Works is understood to have closed against its inquiry for about 2000 tons of cylinder iron and of the grade it classifies as floor iron. The latter is about equal to No. 2 X. An eastern Pennsylvania steel company has placed an order against its recent inquiry for 6000 tons of basic, and it is believed that a price lower than $14 was secured. Sellers have been declaring almost unanimously that their price was $14, delivered, but the mill referred to notified at least two sellers that it could buy for less. Not all of the recent irregularity has disappeared from the market. In some cases foundries are not only taking deliveries in a satisfactory way but they are anticipating shipments. Again, there are others whose deliveries under contracts are in excess of their needs. They say that all their departments except their foundries are busy. In Virginia irons the week has been quieter. A maker of standard low phosphorus is now quoting $21.50, delivered, and is not anxious to book any orders at this time, such is his faith in the near future. Makers of Lebanon low phosphorus are comfortably sold up. Shipments of low phosphorus to Canada keep up at a good rate and new inquiries are coming out. In one case a bid based on $21.50, Philadelphia, did not bring an order, and $21, delivered, is still more nearly the market. Quotations for standard brands for early delivery in buyers' yards in this district are as follows:

Eastern Penna. No. 2 X, foundry	$14.25 to $14.50
Eastern Penna. No. 2 plain	14.00 to 14.25
Virginia, No. 2 X, foundry	15.25 to 15.75
Virginia No. 2 plain	15.00 to 15.25
Gray forge	13.25 to 13.50
Basic	13.75
Standard low phosphorus	21.00

Ferroalloys.—The nominal quotation for 80 per cent ferromanganese is unchanged at $100 for future de-

liveries of the English product. Sales of small lots of spot are reported to have been made around Pittsburgh at $118, and five tons is said to have sold at $128 per ton. A local producer is receiving an increasing number of inquiries. Ferrosilicon, 50 per cent, is quoted at $71 to $73, Pittsburgh, according to quantity.

Bars.—Specifications for steel bars have been entered in satisfactory volume in the past week. They have come largely from jobbers, although small consumers want direct shipments also. An eastern mill has taken an order for 4000 tons of shrapnel rounds and inquiries continue to indicate a growth of this business. The general quotation for steel bars is on the basis of 1.25c., Pittsburgh, or 1.409c., Philadelphia, although it is admitted by some that 1.359c. might be considered in the case of a big proposition. The asking price of iron bars is 1.15c., mill, or 1.22½c., Philadelphia.

Plates.—The excellent conditions referred to a week ago have been maintained. Every day of the week has been good and the one common cause of complaint is that deliveries are not quick enough. For prompt delivery, 1.359c., Philadelphia, is still quoted, although some mills ask 1.409c. Contracts for the third quarter have been made at 1.409c. The bulk of orders continue largely of the miscellaneous variety. The New York Shipbuilding Company, Camden, N. J., has taken an order for four tank vessels, but there is no hurry about deliveries and the plate requirements belong to the future.

Rails.—The Pennsylvania Railroad has placed with the Pennsylvania Steel Company contracts covering material for the terminal improvements on Delaware Avenue, Philadelphia. It is the largest frog and switch contract ever let, involving a heavy tonnage of rails, joints, frogs and switches. No other rail orders are reported.

Structural Material.—This market is the least active of any, and the month, as a whole, will not make a good showing so far as orders are concerned. The plant extension of the Baldwin Locomotive Works at Eddystone will require between 4000 and 5000 tons additional to that which will be supplied by the McClintic-Marshall Company. Though nothing tangible is to be obtained, it is likely that contemplated improvements at various shipyards will require fabricated shapes before long. It is not expected that the requirements will be widely advertised. After July 1 all of the mills will be asking 1.409c., Philadelphia, as some have been doing for some days.

Sheets.—The market continues to improve. The quotations for No. 10 blue annealed sheets range from 1.459c. to 1.509c., Philadelphia.

Billets.—Specifications against contracts are good and a pleasing amount of new business has come out. If the trend continues, prices will soon stiffen. The business of an eastern tool maker, which has been very slow, is fast improving and he has ordered 2000 tons of billets. Smaller orders have come from other directions. The quotation for open-hearth rolling billets is $22.02. Forging steel commands an extra of $4 to $5.

Old Material.—The market is stronger for all grades. Several sales of heavy melting steel have been made at $11.50, and dealers are asking up to $12. Cast scrap commands more interest, and there is a better call for specialties. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates from 35c. to $1.35 per gross ton, are as follows:

No. 1 heavy melting steel	$11.25 to $11.50
Old steel rails, rerolling	11.50 to 12.00
Low phos. heavy melting steel scrap.	14.75 to 15.25
Old steel axles	14.00 to 14.50
Old iron axles	17.50 to 18.00
Old iron rails	15.00 to 15.50
Old carwheels	11.75 to 12.25
No. 1 railroad wrought	13.00 to 13.25
Wrought-iron pipe	10.75 to 11.00
No. 1 forge fire	8.50 to 9.00
Bundled sheets	9.00 to 9.50
No. 2 busheling	7.75 to 8.25
Machine shop turnings	8.50 to 8.75
Cast borings	8.25 to 8.50
No. 1 cast	12.25 to 12.50
Grate bars, railroad	9.00 to 9.25
Stove plate	9.00 to 9.50
Railroad malleable	9.50 to 10.00

Coke.—Contracts for foundry coke are being placed steadily. The booking of second-half contracts for furnace coke proceeds slowly. Quotations for prompt delivery furnace coke range from $1.55 to $1.60 per net ton at oven, with second half at $1.75. Prompt foundry is quoted at $2 to $2.40 and contract at $2.20 to $2.50. Freight rates from the principal producing districts are as follows: Connellsville, $2.05; Latrobe, $1.85, and Mountain, $1.65.

Buffalo

BUFFALO, N. Y., June 29, 1915.

Pig Iron.—Business conditions in the foundry trade seem to be improving and the demand for iron is growing. A large total of inquiry is reported in the week, both for foundry grades and malleable, and bookings amounted to about 12,000 tons of all grades. One producer reports sales of 5000 tons of foundry and malleable to New England and New York State points for delivery over second half. Shipments on contracts are increasingly heavy, with users continuing to send in "hurry-up" calls and anticipating more and more their deliveries for second half. We quote as follows, f.o.b. furnace, Buffalo, for last half deliveries:

No. 1 foundry	$12.75 to $13.25
No. 2 X foundry	12.50 to 13.00
No. 2 plain	12.50 to 12.75
No. 3 foundry	12.25 to 12.75
Gray forge	12.25 to 12.75
Malleable	12.50 to 12.75
Basic	13.00 to 13.50
Charcoal, regular grades and analysis	15.75 to 17.25
Charcoal, special grades and analysis	19.00 to 20.00

Finished Iron and Steel.—Sales agencies report specifications in larger volume than for a number of months, most users specifying complete on contracts expiring June 30. Mills are taking the position that unspecified quantities will be canceled July 1. It is reported that the demand for cold finished steel exceeds anything in recent years. The demand for bolts keeps improving. Bids are to go in July 9 to the city hospital commission, Buffalo, for administration building, tuberculosis pavilions and power house for the new city hospital, Buffalo, requiring approximately 600 tons of steel. These preliminary buildings will cost $600,000. The Washington Iron Works, Buffalo, have the contract for a small tonnage for a warehouse to be erected for the Eureka Coffee Company, Buffalo.

Old Material.—The demand in most lines continues active and several good sized sales of heavy melting steel have been made, aggregating about 3000 tons. Contract shipments are going forward freely to users. While prices remain unchanged, the large amount of business being placed and the activities of the steel mills forecast a higher level in the near future. We quote dealers' asking prices, per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel	$10.75 to $11.00
Low phosphorus steel	13.00 to 13.50
No. 1 railroad wrought scrap	10.50 to 11.00
No. 1 railroad and machinery cast	11.00 to 11.50
Old steel axles	12.00 to 12.50
Old iron axles	16.00 to 16.50
Old carwheels	11.50 to 12.00
Railroad malleable	10.50 to 11.00
Machine shop turnings	5.75 to 6.25
Heavy axle turnings	8.50 to 9.00
Clean cast borings	6.75 to 7.00
Old iron rails	11.00 to 11.50
Locomotive grate bars	9.00 to 9.50
Stove plate (net ton)	8.25 to 8.75
Wrought pipe	7.00 to 7.50
Bundled sheet scrap	7.25 to 7.75
No. 1 busheling scrap	8.50 to 9.00
No. 2 busheling scrap	6.50 to 7.00
Bundled tin scrap	9.00

Boston

BOSTON, MASS., June 29, 1915.

Old Material.—The steel market has continued its strengthening process until the dealers have marked up their prices 25c. The demand for foundry scrap is also stronger. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points

which take Boston rates. Mill prices are approximately 50c. per ton higher.

Heavy melting steel	$8.50 to	$8.75
Low phosphorus steel	13.75 to	14.75
Old steel axles	12.75 to	13.25
Old iron axles	20.25 to	20.75
Mixed shafting	12.00 to	12.25
No. 1 steel wrought and soft steel	8.25 to	8.75
Skeleton (bundled)	5.50 to	5.75
Wrought-iron pipe	7.00 to	7.50
Cotton ties (bundled)	5.25 to	5.75
No. 2 light	3.25 to	3.75
Wrought turnings	5.00 to	5.50
Cast borings	5.00 to	5.25
Malleable	7.50 to	7.75
Stove plate	7.00 to	7.50
Grate bars	5.25 to	5.50
No. 1 machinery cast (price to consumer f.o.b. the buyer's foundry)	13.00 to	13.50
No. 2 machinery cast (price to consumer f.o.b. the buyer's foundry)	11.50 to	12.00

Cincinnati

CINCINNATI, OHIO, June 30, 1915.—(*By Wire.*)

Pig Iron.—Southern foundry prices appear to be hardening a little, doubtless due to the comparatively comfortable condition of order books. The furnaces are not willing to take on too much iron for future shipment at present prices, and at least two have named $10, Birmingham basis, as their minimum quotation for either prompt or last half shipment. However, there is still some prompt analysis iron on the market available at $9.50. The majority of the producers are quoting $9.75 for nearby shipment, but this price would be acceptable to many for last half business. A local melter is inquiring for 500 tons of mixed Southern grades for shipment through the remainder of the year, and a like quantity is wanted by a Louisville consumer. An Indiana company is feeling the market on about 800 tons of Northern and Southern iron. A northern Ohio manufacturer is in the market for 1000 tons of Lake Superior charcoal. These represent all the open inquiries of consequence before the trade here. The usual small business is still below normal, but continued optimistic reports are made as to shipments on contracts. The amount of foundry coke going forward indicates also that the melt of iron is increasing at a small but steady rate. Northern No. 2 foundry and malleable are unchanged at $12.50, Ironton basis, for any shipment this year. No basic inquiries are reported from consumers in this territory. Based on freight rates of $2.90 from Birmingham and $1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft	$12.90 to	$13.40
Southern coke, No. 2 f'dry and 2 soft	12.40 to	12.90
Southern coke, No. 3 foundry	11.90 to	12.40
Southern No. 4 foundry	11.40 to	11.90
Southern gray forge	10.90 to	11.40
Ohio silvery, 8 per cent silicon	16.01 to	16.26
Southern Ohio coke, No. 1	14.76 to	15.26
Southern Ohio coke, No. 2	13.76 to	14.26
Southern Ohio coke, No. 3	13.51 to	13.76
Southern Ohio malleable Bessemer	13.76 to	14.01
Basic, Northern	13.76 to	14.01
Lake Superior charcoal	16.20 to	17.20
Standard Southern carwheel	26.90 to	27.40

(*By Mail*)

Coke.—No sales of furnace coke have been made here lately and, as far as known, no new business is under negotiation. Connellsville and Virginia foundry cokes range from $2.25 to $2.50 per net ton at oven for contract, but as low as $2.10 can be done on a few brands for prompt delivery. Foundry contracting is not heavy, but some business is still coming in.

Finished Material.—Mills in this vicinity are quoting around 5c., Pittsburgh basis, on No. 28 galvanized sheets. Black sheets are unchanged at 1.80c., Pittsburgh, for No. 28 but some improvement is reported from different sources. Steel hoops and bands are quoted at 1.35c. and 1.25c., respectively, Pittsburgh. Local warehouses are selling steel bars from stock at 1.75c. Railroad track material shows a slight improvement.

Old Material.—Several dealers state that the situation is more encouraging and business in several grades of scrap is on the mend. The change has not been radical enough to affect prices and all quotations are unchanged. The rolling mills are said to be the best customers at present. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices, f.o.b. at yards:

Per Gross Ton

Bundled sheet scrap	$6.25 to	$6.75
Old iron rails	10.50 to	11.50
Relaying rails, 50 lb. and up	19.25 to	19.75
Rerolling steel rails	9.75 to	10.25
Melting steel rails	8.50 to	9.00
Heavy melting steel scrap	8.50 to	9.00

Per Net Ton

No. 1 railroad wrought	$8.50 to	$9.00
Cast borings	4.50 to	5.00
Steel turnings	4.50 to	5.00
Railroad cast scrap	9.00 to	9.50
No. 1 machinery cast scrap	10.25 to	10.75
Burnt scrap	6.50 to	7.00
Old iron axles	13.50 to	14.00
Locomotive tires (smooth inside)	8.50 to	9.00
Pipes and flues	5.75 to	6.25
Malleable and steel scrap	7.00 to	7.50
Railroad tank and sheet scrap	5.00 to	5.50

The Reliance Iron & Coke Company, Cincinnati, Ohio, has been incorporated with a nominal capital stock of $25,000 by Julius Fleischmann, Alfred Knight, Albert E. Leon, Herbert Black and Irwin Davis. The company, which is closely identified with the Reliance Coal & Coke Company, has engaged offices in suite 815 Union Central Life Building, and will do a general iron and coke business. Julius Fleischmann is president; Herbert Black vice-president and general manager; William E. Minor treasurer, and Charles J. Christie, secretary.

Herbert Black, who will have active charge of the new company, is well known to the pig-iron trade in the Central West, having been associated a number of years with Frank M. Eaton, formerly Cincinnati manager of Hickman, Williams & Co.

Cleveland

CLEVELAND, OHIO, June 29, 1915.

Iron Ore.—The market shows a little more life than for a number of weeks past. A few small lot sales are reported and some new inquiries are coming out. We quote prices as follows delivered at lower lake ports: Old range Bessemer, $3.75; Mesaba Bessemer, $3.45; Old range non-Bessemer, $3; Mesaba non-Bessemer, $2.80.

Pig Iron.—There is an improved volume of inquiry in this territory for foundry iron for last half delivery in lots of 400 to 500 tons and under. However, very few sales are reported. Additional inquiries have come out for the first half of next year, but no orders for that delivery have been booked, as consumers want to buy at present prices and dealers will not take orders for that delivery except at some advance in prices. Blast furnace interests believe that a shortage of common labor is probable later in the season should general conditions continue to improve and that would tend to stiffen prices. At present, however, little effort is being made to get higher prices than have been prevailing and Northern grades are quoted at $12.50 Cleveland and Valley furnace for No. 2. Southern iron is unchanged at a minimum of $9.50, Birmingham, for No. 2 for prompt shipment and the third quarter. We quote, delivered Cleveland, as follows:

Bessemer		$14.65
Basic		13.55
Northern No. 2 foundry		13.00
Southern No. 2 foundry	$13.50 to	14.00
Gray forge		12.75
Jackson Co. silvery 8 per cent silicon	16.37 to	16.62
Standard low phosphorus at furnace	19.75 to	20.00

Coke.—Some additional contracts have been placed for foundry coke and it is believed that about 80 per cent of the trade is now covered for its requirements either for the last half or for a year. Some sales of spot shipment coke are being made to consumers that are not under contract. Furnace coke is dull. Standard foundry grades are held at $2.25 to $2.50 per net ton at oven for spot shipment and contract. Some Wise County coke has been booked at $2.35 for delivery during the year. Furnace coke is quoted at $1.55 to $1.60 for prompt shipment and $1.70 to $1.75 for contract.

Finished Iron and Steel.—The demand for finished steel continues to improve and specifications received by local mills and selling agencies during June show a considerable increase over May. A heavy volume of

orders has come out on contracts expiring June 30 and some specifications are already coming in on 1.20c. steel bar contracts for the third quarter. New inquiry for steel for war material includes 50,000 to 60,000 tons of bars for export and 42,000 tons of bars for 3½-in. high explosive shells for England. Prices on steel bars and structural material are firm at 1.25c., Pittsburgh, and some additional round-lot bar business has been booked at that price for the last half. Plates are firmer, although the 1.20c. price can probably still be shaded. The heavy demand for forging steel bars has filled up mills to such an extent that some cannot make deliveries within two or three months. The Union Rolling Mill Company, Cleveland, is at present running its plant entirely on forging steel and will not shut down July 1 for repairs, as is customary. Hard steel bars are selling at 1.10c. to 1.15c., Pittsburgh, the comparatively low price which is usually $1 a ton under soft steel, being due to the competition among makers of hard steel bars. Iron bars are quoted at 1.15c., Pittsburgh. In structural lines the McMyler-Interstate Company, Bedford, Ohio, has taken 400 tons for an addition to the plant of the Hydraulic Pressed Steel Company, Cleveland, and bids are being taken for the St. Louis municipal bridge requiring 24,000 tons. Local fabricating shops are getting a better volume of small work and are busier than they have been for some time. The demand for sheet bars has improved and prices are higher, several sales aggregating 3500 tons for July delivery being made at $21, Youngstown. Black and blue annealed sheets are in good demand, the former being held at 1.75c. to 1.80c., Ohio mill, for No. 28, and the latter at 1.35c. for No. 10. The decline in spelter has not caused any material change in the price of galvanized sheets and some sales are reported at 5c. for No. 28. Warehouse business is good with prices unchanged at 1.80c. for steel bars and 1.90c. for plates and structural material.

Bolts, Nuts and Rivets.—The demand for bolts and nuts has improved, but this is confined largely to the smaller sizes. There is a fair volume of contracting by jobbers and consumers and considerable immediate requirement business. Railroad inquiries reported last week are still pending. While prices are firm there are still some weak spots in the market. A fair volume of business is coming out in rivet contracts which are firm at 1.50c., Pittsburgh, for structural rivets and 1.60c. for boiler rivets. Bolt and nut discounts are as follows: Common carriage bolts ⅝ x 6 in., smaller or shorter, rolled thread, 80 and 10 per cent; cut thread, 80 and 5 per cent; larger or longer, 75 and 15 per cent; machine bolts with h.p. nuts, ⅝ x 4 in., smaller or shorter, rolled thread, 80 and 15 per cent; cut thread, 80 and 10 per cent; larger or longer, 80 per cent; coach and lag screws, 85 per cent; square h.p. nuts, blank or tapped, $6.40 off; hexagon h.p. nuts, blank or tapped, $7.50 off; c.p.c. and t. square nuts, blank or tapped, $6.10 off; hexagon ⅝ in. and larger, $7.60 off; 9/16 and smaller, $8.30 off; semi-finished hexagon nuts ⅝ in. and larger, 85, 10, 10 and 5 per cent; 9/16 and smaller, 85, 10, 10, 10 and 5 per cent.

Old Material.—The market is dull but fairly firm, considering the absence of a demand. Mills are well supplied for July and August requirements. Many consumers have ordered shipments suspended because of July inventories. One local consumer is in the market for heavy melting steel for August and September delivery at $11. Railroad malleable is scarce and firmer. Steel axles are higher and iron axles are lower. We quote f.o.b. Cleveland as follows:

Per Gross Ton

Old steel rails, rerolling	$11.00 to $11.75
Old iron rails	12.00
Steel car axles	12.25 to 12.75
Heavy melting steel	10.50 to 11.00
Old carwheels	9.75 to 10.00
Relaying rails, 50 lb. and over	22.50
Agricultural malleable	8.50
Railroad malleable	10.25 to 10.50
Steel axle turnings	8.75 to 9.00
Light bundled sheet scrap	8.00 to 8.50

Per Net Ton

Iron car axles	$14.00 to $14.50
Cast borings	6.00 to 6.25
Iron and steel turnings and drillings	5.50 to 5.75
No. 1 busheling	8.50 to 8.75
No. 1 railroad wrought	9.25 to 9.50
No. 1 cast	9.75 to 10.25
Stove plate	8.00 to 8.25

Birmingham

BIRMINGHAM, ALA., June 28, 1915.

Pig Iron.—If actual transactions reported are to be relied upon, the Birmingham iron market is firm at $9.75 for spot and $10 for forward delivery. The spot price is extended in some instances where the purchase also includes forward delivery. While business with the remainder of the furnace operators is reported lagging, one interest sold over 60,000 tons, or twice its make, during June. Several thousand tons for July and August delivery brought $9.75. A small tonnage of high manganese sold for $10.50. Small sales of No. 2 have been made at $10.25 and one as high as $10.50. The leading producer continues to hold for $10, as does at least one other. Shipments from furnaces are heavy. One company, which had over 100,000 tons, in January, has reduced stocks almost to the safety limit of 20,000 to 25,000 tons. Demand for prompt shipment is reported by all operators and as a result more stacks are going into blast. The Tennessee Company will blow in No. 5 at Ensley in the immediate future. The Vanderbilt stack of the Woodward Iron Company is to blow in in July. One of the Tennessee Company's furnaces at Bessemer is being repaired and will be ready within ten days, while a second one at that place is understood to be undergoing relining for the manufacture of ferromanganese. In all probability the Sloss-Sheffield will blow in one of its city furnaces in July or in August at the latest. Confidence in the situation is growing. The heavy outgo indicates greater foundry activity. The home melt has been increased by the demand for sugar machinery and other heavy castings. The consumption of water pipe plants is also steady and on a large scale. It is believed in some quarters that speculators have taken on more pig iron—this time at $9.75. Heavier rail manufacture in July than in June is expected at Ensley, while wire making is to continue on the usual satisfactory scale. It is stated that no foreign rail contracts have been recently placed at Ensley. We quote, per gross ton, f.o.b. Birmingham district furnace for spot and forward delivery, as follows:

No. 1 foundry and soft	$10.25 to $10.50
No. 2 foundry and soft	9.75 to 10.00
No. 3 foundry	9.25 to 9.50
No. 4 foundry	9.00 to 9.25
Gray forge	8.75 to 9.00
Basic	9.75 to 10.00
Charcoal	21.00 to 21.25

Cast-Iron Pipe.—The water pipe situation is satisfactory. The run of orders is good and prices are holding with considerable firmness. The demand for sanitary pipe is reported more brisk by salesmen who have recently returned from road trips with respectable lists of sales. We quote, per net ton, f.o.b. makers' yards, as follows: 4-in., $20; 6-in. and upward, $18, with $1 added for gas pipe.

Coal and Coke.—Coke is in greater demand, and the prospect favors further activity, with an increase in furnace resumption. We quote, per net ton, f.o.b oven, as follows: Furnace, $2.50 to $2.75; foundry, $3 to $3.25; by-product, $2.25 to $2.50, with some makes higher. The United Fruit Company has placed a contract for 100,000 tons of coal with the Warrior-Black Coal Company, Birmingham, another 100,000 tons going to the Pittsburgh Coal Company. The Southern Railway is about to contract for its year's requirements. Leading operators say Alabama secured a larger share of the recently-awarded contracts than usual. Steam mines are on a minimum of 50 per cent capacity.

Old Material.—There is a dearth even of inquiry in the scrap market, but dealers are looking for a higher iron market, greater foundry activity and a general improvement before long. We quote, per gross ton, f.o.b. dealers' yards, as follows:

Old iron axles	$13.00 to $13.50
Old steel axles	12.50 to 13.00
Old iron rails	12.50 to 13.00
No. 1 railroad wrought	8.50 to 9.00
No. 2 railroad wrought	7.50 to 8.00
No. 1 country wrought	8.00 to 8.50
No. 1 machinery cast	8.25 to 8.50
No. 1 steel scrap	8.00 to 8.25
Tram carwheels	8.25 to 8.50
Stove plate	7.00 to 7.50

St. Louis

ST. LOUIS, MO., June 28, 1915.

Pig Iron.—Total sales, aside from one of 5000 tons of Northern basic and one of 300 tons of No. 2 Southern foundry, were not particularly larger than in recent weeks. Prices are held quite firmly and the total sales for 30 days have been ahead of expectations.

Coke.—No really new contracts have been made, practically all the business being in the nature of renewals. By-product coke is quoted at $5.10, St. Louis, per net ton, but probably obtainable for less.

Finished Iron and Steel.—All classes of material show a firmer tone in prices, except plates, which are rather weaker. Buyers are being warned not to expect such prompt deliveries as they have been having, and this is expected to help in reviving the disposition to contract ahead. Movement out of warehouse continues free at prices as follows: Soft steel bars, 1.70c.; iron bars, 1.65c.; structural material, 1.80c.; tank plates, 1.80c.; No. 10 blue annealed sheets, 2c.; No. 28 black sheets, cold rolled, one pass, 2.55c.; No. 28 galvanized sheets, black sheet gage, 4.85c.

Old Material.—There is a slightly better tone as result of increasing inquiries, which, however, are coming largely from the North and East, rather than from the local industries. Dealers are holding rather firmly at quoted figures, in anticipation of a brisk demand within 60 days. The only list out during the week was one of 11,000 tons from the Baltimore & Ohio. We quote dealers' prices, f.o.b. St. Louis, as follows:

	Per Gross Ton	
Old iron rails	$10.00 to	$10.50
Old steel rails, rerolling	9.50 to	10.00
Old steel rails, less than 3 ft.	10.25 to	10.75
Relaying rails, standard section, subject to inspection	22.00 to	23.00
Old carwheels	8.75 to	9.25
No. 1 railroad heavy melting steel scrap	8.75 to	9.25
Shoveling steel	7.75 to	8.00
Frogs, switches and guards cut apart	8.75 to	9.25
Bundled sheet scrap	5.50 to	6.00
	Per Net Ton	
Iron fish plates	$10.00 to	$10.25
Steel angle bars	7.75 to	8.25
Iron car axles	13.50 to	14.00
Steel car axles	9.50 to	10.00
Wrought arch bars and transoms	10.75 to	11.25
No. 1 railroad wrought	7.50 to	8.00
No. 2 railroad wrought	7.50 to	8.00
Railroad springs	7.75 to	8.25
Steel couplers and knuckles	7.75 to	8.25
Locomotive tires 42 in. and over smooth inside	8.50 to	9.00
No. 1 dealers' forge	6.75 to	7.25
Mixed borings	4.50 to	5.00
No. 1 busheling	7.00 to	7.25
No. 1 boilers, cut to sheets and rings	5.75 to	6.25
No. 1 railroad cast scrap	7.75 to	8.25
Stove plate and light cast scrap	6.25 to	6.75
Railroad malleable	5.75 to	6.25
Agricultural malleable	5.25 to	5.75
Pipes and flues	5.75 to	6.25
Railroad sheet and tank scrap	5.75 to	6.25
Railroad grate bars	6.25 to	6.50
Machine shop turnings	4.75 to	5.25

San Francisco

SAN FRANCISCO, CAL., June 22, 1915.

Business is still far from satisfactory, although some improvement is observed, and reports of activity elsewhere are reflected in a slightly more hopeful feeling here. In some directions development work is being undertaken with more confidence, but many important buyers are merely covering routine requirements, with no thought of expansion. Merchants' orders are curtailed on account of the lower rail freight rates on finished products, expected to take effect within the next month or two. Traffic conditions, in fact, are very unsettled, and the local market will show some disturbance until more stable conditions arise.

Bars.—A fair tonnage of reinforcing bars has been placed recently, Eastern interests getting a good share of the more important business. Most transactions, however, are small, with immediate delivery desired, which gives some advantage to local mills. Inquiries for plain steel bars are coming out a little more freely, but the total tonnage remains below normal. Prices on carload lots to jobbers continue at about 1.70c. from local mill or warehouse.

Structural Material.—A fair tonnage in this vicinity has lately been taken by the American Bridge Company, including the Eel River bridge and some small bridges in San Joaquin and Monterey counties. Plans are ready for a viaduct at the foot of Market Street in this city, a small but rather attractive job. Tentative figures are asked on several more small county bridges in various parts of the State. Preliminary arrangements are being made for a $1,000,000 State building in San Francisco, and the Southern Pacific Railroad is planning a large station at Fourteenth and Franklin Streets, Oakland.

Rails.—Single carload orders for mine rails, up to about 16-lb. sections, are quite numerous, and a few light-rail orders of some importance have been placed. Heavy rails are quiet. The Tidewater & Southern is preparing to extend its line from Modesto to Turlock, Cal. Several extensions are planned by the transcontinental lines in Oregon.

Plates.—Distributive business has failed to develop any animation, and merchants are buying practically nothing. Tank manufacturers continue to take some tonnage for old contracts and routine work, but no new business of any moment is appearing.

Sheets.—Little new business in galvanized sheets is going to the mills, as most mill agents decline to quote, and some have been asking 5.50c., Pittsburgh, for No. 28, which is considered prohibitive for ordinary purposes. Merchants have been selling out of stock at lower prices, but will probably make an advance in a day or two, as their supplies are not heavy. The situation in galvanized is bringing black and blue annealed into more prominence, but the movement is not heavy.

Wrought Pipe.—Buying of galvanized is greatly curtailed since the second recent advance, as the plumbing and supply houses have been carrying fair stocks, and consuming requirements in the smaller sizes are light. Black pipe is moving a little better. Oil country business is quiet, but the situation is considered much better than at the beginning of the year.

Cast-Iron Pipe.—The city of Los Angeles placed a contract June 17 for 100 tons of 12-in., and Pasadena has placed a contract for about 250 tons. Sacramento took bids June 17 for 2808 ft. of 6 in., but the lowest figure, $32.87 per net ton, was rejected. No other municipal business of any consequence has appeared.

Pig Iron.—Foundry requirements are still limited. Apprehensive of a shortage of some kinds of English iron was relieved by the arrival June 14 of an overdue ship, with 1250 tons of iron and 1703 tons of coke. Prices on foreign iron are as usual subject to considerable irregularity. Spot Jarrow has been quoted around $21 per gross ton, and Tata at about $26, or $24 to arrive. No. 1 Southern foundry iron sells to arrive at $20.50 to $21 per gross ton.

Coke.—Notwithstanding the recent arrival of foreign coke, spot offerings are showing signs of depletion, and with only a few small lots to arrive within the next few months, holders are firm in their views at to prices, asking $14 to $15 per net ton from yard. A good deal of southern and eastern coke is coming in, but foundrymen are reluctant to place contracts for extended delivery, owing to the possibility of change in importing conditions.

The Harvey Company, recently incorporated, has engaged in the sale of supplies and equipment for railroads, contractors, etc., with office and warehouse at 113 South street, Baltimore, Md. Arrangements will be made for representing important manufacturers throughout the country, giving customers the benefit of quick shipments either direct from mill or stock at the warehouse in Baltimore. It will maintain a storage yard at Curtis Bay, Md., on the Baltimore & Ohio Railroad, where facilities will be arranged for the storage of contractors' engines, cars, etc. J. Edward Harvey, president of the company, was formerly vice-president of the South Baltimore Steel Car & Foundry Company and proprietor of the Eastern Railway Supply Company. Manufacturers are requested to send their catalogues.

New York

NEW YORK, June 30, 1915.

Pig Iron.—Two Buffalo furnace companies have advanced their asking price to $13 for No. 2 X foundry iron. The Erie Canal rate to tidewater is $1.75. It is not clear to what extent $12.50 can still be done at Buffalo, but the feeling among producers seems to be that with a very considerable part of their capacity sold for the remainder of 1915 they are in a position to wait for a better price than has prevailed recently. A considerable inquiry for malleable pig iron has come up in New England, but transactions in that section are few. The inquiries that were recently pending in New Jersey have not yet developed into business, with one or two exceptions. One of these is for 1500 tons for a Newark foundry. The failure of pig iron the country over to respond to the improvement of the past three months in finished material, more marked in the past month, has led buyers to take a conservative attitude. The increasing pig iron production in the Central West, due to the blowing in of additional merchant furnaces, has reacted on the basic pig iron situation in the East. However, some furnaces are shaping their policy in line with the steel market in the belief that higher prices for pig iron will be seen later in the year. The recent purchase of basic iron by a New Jersey steel company from a Delaware River furnace amounted to 10,000 tons. We quote at tidewater as follows: No. 1 foundry, $14.50 to $14.75; No. 2 X, $14.25 to $14.50; No. 2 plain, $13.75 to $14; Southern iron, $14.50 to $14.75 for No. 1 and $14.25 for No. 2.

Ferroalloys.—British ferromanganese is believed to be coming in in sufficient volume to satisfy the present needs of consumers, especially so far as the filling of old contracts is concerned. New business is light at the quotation of $100, seaboard, and no great anxiety as to future supplies, as steel production increases, is yet manifested. Official statistics show that for the quarter ending March 31, 1915, imports of ferromanganese were only 548 gross tons, against 19,884 tons for the preceding quarter, and 25,731 tons for the three months ending Sept. 30, 1914, or the first quarter of the fiscal year. It is estimated here, however, that the last quarter, ending June 30, 1915, will show receipts considerably exceeding 25,000 tons, which is the average for a three months' period for five years. A western Pennsylvania furnace, which for some time has been making a rather low-manganese alloy, is now offering an 80 per cent ferromanganese for sale. Ferrosilicon, 50 per cent, is in very active demand, especially for domestic use, with foreign inquiry and sales by no means insignificant, at $71 to $73, Pittsburgh.

Structural Material.—In spite of the few good sized projects which appear, there is a strong belief that structural mills will shortly become increasingly busier. The chief evidence of this attitude at the present time probably is the haste shown by buyers, including the smallest fabricators, to get protection even for material for work not yet completely designed. Contracting has been good and while 1.20c., Pittsburgh, may still be done, it is a figure not commonly heard and in some quarters it is believed it will disappear on July 1. Some demand continues to come from Europe and South America. Among new work may be mentioned 500 tons for a lime plant for the Vermont Marble Company, Rutland, and an early decision is expected on 3000 tons for shops for the Fore River Shipbuilding Company. The Hedden Iron Construction Company is to erect the No. 4 Goetsh Building, Wythe Avenue, Brooklyn, 400 tons; Eastern Steel Company, a sugar plant in Cuba, 750 tons, and the Harris-Silvers-Baker Company, the Victoria Theater, New York, 200 tons. We quote mill shipments at 1.20c. to 1.25c., Pittsburgh, or 1.369c. to 1.419c., New York, and from store 1.85c. to 1.90c., New York.

Steel Plates.—The week's development in car buying has not been encouraging, but Eastern plate mills are running at 80 to 85 per cent capacity on orders in hand. No special emphasis is placed on the feelers for foreign buying. Locally there has been a better demand for repairing ships. Contracts for the third quarter, though these do not total very much in this section, are not yet all closed. Quotations are now more generally 1.20c., Pittsburgh, or 1.369c., New York, for third quarter, and $1 more for fourth quarter, and from store 1.85c. to 1.90c., New York.

Iron and Steel Bars.—Foreign inquiry for exceedingly large amounts continues to be the special feature. Moreover some earlier orders for steel bars for shells are being offered under sub-contracts, so urgent is the demand for deliveries. Shipping facilities are reported improved with slightly lower rates. The war demand is regarded in general as so strong and affecting so widely diversified industries that with the present status of domestic consumption mills will be exceedingly active into the fall at least. One jobbing house, owing largely to business derived because of the war, has done considerably more business in the first half of this year than in the whole of 1914. Bar iron prices are looking up and contracting has been active with considerable going at 1.25c. at mill for the second half to manufacturing consumers, and 1.20c. at mill for the third quarter to jobbers. Immediate shipment is 1.15c. and 1.20c., the lower figure for the more attractive business. We quote mill shipments of steel bars at 1.25c., Pittsburgh, or 1.419c., New York, and refined iron bars, 1.20c. to 1.25c., New York. Out of store in New York iron and steel bars are 1.80c. to 1.85c.

Cast-Iron Pipe.—The lowest bidder on about 3000 tons of 6 to 20 in., on which bids were opened at East Orange, N. J., on Monday, June 28, was the United States Cast Iron Pipe & Foundry Company. The only important public letting in this vicinity now coming up is that of Yonkers, N. Y., for 425 tons of 6 and 8 in., on which bids will be opened July 6. Private buying continues in quite satisfactory volume. The advanced prices now being quoted by manufacturers are well held, with an upward tendency. Carload lots of 6-in., class B and heavier, are quoted at $22.50 to $23 per net ton, tidewater, class A and gas pipe taking an extra of $1 per ton.

Old Material.—While they do not appear anxious to place contracts for future delivery, eastern Pennsylvania steel companies are steadily buying moderate quantities. A new consumer of heavy melting steel scrap at Lebanon, Pa., is understood to have taken a moderate quantity the past week. Prices are well maintained, and it would apparently need but a little stronger buying movement to establish a higher level. Rolling mills are taking small quantities of wrought pipe, shafting and other specialties. Brokers' quotations to local dealers and producers, per gross ton, New York, are as follows:

Old girder and T rails for melting	$9.00 to	$9.25
Heavy melting steel scrap	9.00 to	9.25
Relaying rails	19.00 to	19.50
Rerolling rails (nominal)	9.00 to	9.25
Iron car axles (nominal)	15.25 to	15.75
Steel car axles (nominal)	11.75 to	12.25
No. 1 railroad wrought	10.50 to	10.75
Wrought-iron track scrap	9.50 to	9.75
No. 1 yard wrought, long	9.50 to	9.75
No. 1 yard wrought, short	9.00 to	9.25
Light iron (nominal)	3.25 to	3.75
Cast borings	6.00 to	6.25
Wrought turnings	6.00 to	6.25
Wrought pipe	8.50 to	8.75

Foundrymen continue to make purchases of cast scrap, some of them buying quite freely. Quotations to consumers are as follows, per gross ton, New York:

Old carwheels	$9.50 to	$10.00
No. 1 machinery cast	10.50 to	11.00
No. 2 heavy cast	9.75 to	10.25
Stove plate	8.00 to	8.25
Locomotive grate bars	7.50 to	8.00
Malleable cast (railroad)	7.50 to	8.00

The American Metal Products Company, 3009 Lisbon Avenue, Milwaukee, Wis., organized about two years ago, is producing a new copper alloy metal designated as Ampco bronze, which is claimed to possess the strength of steel and can be die-cast in steel molds to a finished state. It stands acid tests and can be annealed or softened. It is 18 per cent lighter than brass. A. Littmann is the discoverer of the formula. Peter Weber, until last November city chemist of Milwaukee, is president of the company, which is preparing to increase its capital stock from $25,000 to $100,000 to provide for increased activities.

British Market Dull

Pig Iron Easier and Coke High—Steel Prices and Operating Costs Advancing

(*By Cable*)

LONDON, ENGLAND, June 30, 1915.

The pig-iron market remains dull but slightly easier. There is no inducement at present among warrant speculators to operate for higher prices. It is generally expected that prices will advance owing to excessive costs. Shipments are improving and the June returns are expected to be the best this year. Hematite iron remains quiet, though some sales have been made to Sheffield and Italy. The coke position is exceedingly stiff. Semi-finished steel is firm, and finished steel prices continue upward. Stocks of pig iron in Connal's stores were 152,633 tons at the close of last week against 153,820 tons one week previous. We quote as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 19s. ($4.62).

Cleveland pig-iron warrants, 66s. 2½d. ($16.11), compared with 66s. 4d. ($16.14) last week.

No. 3 Cleveland pig iron, makers' price, f.o.b. Middlesbrough, 66s. 6d. ($16.18).

Steel black sheets, No. 28, export, f.o.b. Liverpool, £11 15s. ($57.18), against £11 10s. ($55.96) a week ago.

Steel ship plates, Scotch, delivered local yards, £9 15s. ($47.44).

Steel rails, export, f.o.b. works port, £8 7s. 6d. ($40.75).

Hematite pig iron, f.o.b. Tees, 100s. ($24.33).

Sheet bars (Welsh), delivered at works in Swansea Valley, £7 10s. ($36.49), against £7 15s. ($37.71) last week.

Steel joists, 15 in., export, f.o.b. Hull or Grimsby, £10 ($48.66).

Steel bars, export, f.o.b. Clyde, £10 15s. ($52.31).

Ferromanganese, f.o.b. £20 15s. ($100.98).

Ferrosilicon, 50 per cent, c.i.f., £14 5s. ($69.35).

Pig Iron Shipments to Italy—Galvanized Sheets and Bar Iron Soaring

(*By Mail*)

LONDON, June 16, 1915.

A distinctly firmer tone in the Cleveland pig-iron trade is due to an enlarged demand from consumers at home, while export permits are being granted for foundry iron with a fair degree of facility. Considerable shipments seem to have been arranged for the latter part of this month, and prices have had an upward tendency, with the entire output going into consumption. The war news is generally felt to be slightly better, though still not affording ground for much optimism, but speaking generally the outlook is improved and more interest is being taken in the speculative market. It is thought that the forecasts regarding the probability of increased trade with Italy are being justified, for a good cargo has already been arranged for shipment to Genoa, and this is almost certain to be the prelude to further business. There has been a distinct upward movement in prices and this has caused consumers to take more interest. Cleveland foundry iron still falls below the level which producers declare they should be able to obtain with the present high cost, and is low in comparison with hematite.

East Coast hematite is still a poor market, but should improve. A few inquiries are met with, but the actual business is decidedly not up to the mark. Consumers still hold back while there are heavy supplies of ore available, partly owing to the disposal of prize cargoes. Coke continues dear and very scarce and consumers are resentful of the prices demanded and indisposed to contract for large quantities.

GALVANIZED SHEET OUTPUT MUCH CURTAILED

The galvanized sheet position is exceedingly difficult and it is certain that output must be greatly curtailed not only by the excessive cost of spelter, but by the fact that the consumption of this metal for purposes other than munitions is likely to be greatly restricted, in order that the position as regards cartridge-metal may be kept intact. The price of ordinary 24-gage galvanized corrugated sheets has now been lifted to £22 10s. ($104.62) a ton in bundles, f.o.b., but only a few works are open to do business and these for but small quantities and for early delivery. At the same time there has been an all-round upward move in the matter of thin gages. While there is no agreement among makers regarding the extras, some makers now quote the following premiums over 24-gage:

25 gage	£3 5s. ($15.82)	per ton
26 gage	£3 10s. ($17.03)	per ton
27 gage	£4 5s. ($20.69)	per ton
28 gage	£5 ($24.33)	per ton
28½ gage	£5 15s. ($27.98)	per ton
29 gage	£6 10s. ($31.63)	per ton
30 gage	£8 ($38.93)	per ton
31 gage	£9 10s. ($46.23)	per ton

There has been a further upward movement in the price of bar iron, and within the last few days South Staffordshire makers have intimated a rise of 20s. ($4.87) a ton in marked bars, making it £12 ($58.40) a ton, which is the highest price in over forty years, while there is no assurance that the ultimate limits of the movement have yet been reached. The causes of the continual appreciation in prices are the rise in costs of raw material, including fuel, and the great increase in wages. In spite of the almost prohibitive cost of best bars there is an urgent demand, which works, hampered as they are by all sorts of difficulties, to say nothing of the impossible attitude of labor, find themselves unable to meet to the extent desired. The output, indeed, is exceedingly small and more likely to decrease than to broaden. A very large number of men have enlisted and cannot be replaced, while owing to the excessive heat turns are being missed, with the attendant dislocation which this entails.

Steel prices go up without cessation, but Japan and China now find British prices c.i.f. cheaper than American. Rail business is very indifferent.

Metal Market

NEW YORK, June 30, 1915.

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York			Lead		Spelter	
June	Lake	Electrolytic	Tin, New York	New York	St. Louis	New York	St. Louis
23	22.50	20.00	41.00	5.75	5.35	18.00	17.50
24	22.50	20.00	41.00	5.75	5.35	18.50	18.00
25	22.50	20.00	41.25	5.75	5.35	20.00	19.50
26	22.50	20.00	.....	5.75	5.35	20.50	20.00
28	22.50	20.00	40.50	5.75	5.50	21.00	20.50
29	22.50	20.00	40.00	5.75	5.60	21.50	21.00

The copper producers hold firmly to their quotations, but resale metal is easier. Tin is lower and has been inactive, except for occasional buying of spot. Low-priced lead is disappearing and there is less variance in quotations. Spelter shows signs of activity again and prices have advanced. Antimony is a trifle easier.

New York

Copper.—The producers of electrolytic hold to their quotations of 20.25c. to 20.50c., 30 days, delivered, and are awaiting a buying movement expectantly. As a matter of fact, some large orders for war material are hovering over the market. With second-hands the metal is heavy. Prompt can be had at 20c. cash, New York, and July probably could be had at 19.87½c. cash. A bid of 19.62½c., cash, New York, would be accepted for a far-off delivery. Some renewed interest has been shown in Lake in the past few days and a few odd carloads of prime metal were to be had at a little under 22.50c., but that continues the general quotation. The exports this month total 15,451 tons.

Copper Averages.—The average price of Lake copper for the month of June, based on daily quotations in THE IRON AGE, was 22.38c., and of electrolytic 19.80c.

Tin.—Until last Friday the market was quiet. On that day about 150 tons changed hands, and then the market lapsed into quiet again which lasted until yesterday when between 200 and 250 tons was sold. Practically all of the business was in small lots of spot and early shipments from London. The June deliveries into consumption reached the excellent total of 3900 tons, of

which 3000 tons arrived at Atlantic ports, and 900 tons came east from Pacific ports. In stock the landing is 2319 tons. The market has been rendered quieter than usual because of the elimination of speculation, which has been brought about by England's restrictions on trading. The quantity now reported afloat is 5205 tons. The exports this month total 6606 tons. The price in New York yesterday was 40c.

Lead.—The market is steadily growing stronger. The largest interest continues to hold at 5.75c., New York. Others have continued to sell at concessions, although their prices have been gradually creeping up under the influence of steady buying. To-day, 5.70c., New York, is about the lowest price that can be found, as the last of the 5.50c. lots was taken yesterday. The St. Louis quotation yesterday was 5.60c. The irregularity of the market may be realized from the fact that a sale was made yesterday at slightly over 5.75c., New York.

Spelter.—Renewed interest on the part of consumers, coupled with labor troubles in the ore fields, caused quotations to advance until 21.50c. to 22c., New York, was quoted yesterday for prime Western, prompt delivery. For July and August, at least 20c. could be obtained. The St. Louis quotation yesterday was 21c. Brass mill special is quoted at 28c. to 30c., and for very choice grades 40c. has been offered. The London market yesterday advanced £7 10s. and this had a stimulating effect on the market here. With the higher prices, buying became considerably more active, and the market to-day is strong. Exports this month total 2740 tons.

Antimony.—The market is a trifle easier, Chinese and Japanese, spot delivery, being offered at 36.25c. to 36.50c., duty paid. July arrivals are quoted at 35c. in bond, which is equal to over 38c., while August and September arrivals range about 37.75c. The lower price of prompt metal is attributed to a desire to realize on stock now on hand.

Old Metals.—The market is dull. Dealers' selling prices are nominally as follows:

	Cents per lb.
Copper, heavy and crucible	18.25 to 18.75
Copper, heavy and wire	18.00 to 18.50
Copper, light and bottoms	15.50 to 16.00
Brass, heavy	13.50 to 14.00
Brass, light	11.50 to 12.00
Heavy machine composition	14.50 to 15.00
No. 1 yellow rod brass turnings	14.00 to 15.00
No. 1 red brass or composition turnings	12.50 to 13.00
Lead, heavy	5.00
Lead, tea	1.75
Zinc, scrap	12.00

Chicago

JUNE 28.—The appearance of some resale copper at figures slightly under the price at which producers are holding is modifying somewhat the firmer aspects of the market. Spelter prices have again advanced from the 18c. level, and sheet zinc, while quotable at nominal figures only, has moved up correspondingly. Antimony continues its upward trend. We quote: Casting copper, 19.25c.; Lake copper, 20.25c.; tin, carloads, 41c.; small lots, 43c.; lead, 5.50c. to 5.75c.; spelter, nominally, 21.25c.; sheet zinc, nominally, 25c.; Cookson's antimony, 52c.; other grades, 40c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 16c.; copper bottoms, 15c.; copper clips, 15.75c.; red brass, 13c.; yellow brass, 12.75c.; lead pipe, 4.75c.; zinc, 8c.; pewter, No. 1, 23c.; tinfoil, 33c.; block tin pipe, 36c.

St. Louis

JUNE 28.—Still further readjustment of the excited condition of the non-ferrous metal markets has taken place and a generally calmer feeling exists, though all prices are still measurably high. Lead is quotable to-day at 6c.; spelter, 22c.; tin, 43½c.; electrolytic copper, 20½c.; Lake copper, 21c.; Cookson's antimony, 42c. In the Joplin ore market zinc blende settled back to $110 for the top price on 60 per cent, with premium ores running to $113. A settlement on a premium grade sale of two weeks ago was made the past week which ran the high record of the camp up to $139.50 per ton for jack. The basis range ran as low as $70 on low grade ores. Calamine was rather erratic, ranging from $50 to $75 for 40 per cent, with the best settlement around $80. Lead ore was quiet at $60 per ton for 80 per cent, a decline of $15. Miscellaneous scrap metals are quoted as follows: Light brass, 10c.; heavy yellow brass, 11½c.; heavy red brass and light copper, 13¼c.; heavy copper and copper wire, 17c.; tinfoil, 32c.; pewter, 25c.; lead, 4¾c.; zinc, 12c.; tea lead, 3½c.

Iron and Industrial Stocks

NEW YORK, June 30, 1915.

The stock market maintains its strength, but no special features have appeared since last report. Crop prospects are brilliant, financial conditions are satisfactory, business developments are increasingly favorable, and it is felt that the official assurance of a continuance of amicable relations with Germany is all that is needed to impart a strong upward movement in security prices. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week has been as follows:

Allis-Chal., com.	16¾ - 18⅛	Pressed Stl., pref.	98⅛ - 99⅝
Allis-Chal., pref.	52 - 54¼	Ry. Steel Spring, com.	32¼ - 32⅝
Am. Can, com.	43 - 46¼	Republic, com.	29 - 30
Am. Can, pref.	100¼ - 102	Republic, pref.	88 - 88¼
Am. Car & Fdy., com.	52⅞ - 56⅛	Rumely Co., com.	4½ - 5⅝
Am. Loco., com.	49½ - 53¾	Rumely Co., pref.	11⅝ - 13
Am. Loco., pref.	97 - 98	Sloss, com.	35½ - 37½
Am. Steel Fdries.	37⅞ - 41	Pipe, com.	13⅝ - 14
Bald. Loco., com.	64 - 68	Pipe, pref.	40
Bald. Loco., pref.	102 - 103	U. S. Steel, com.	59¾ - 61½
Beth. Steel, com.	166 - 171	U. S. Steel, pref.	109¼ - 109¾
Colo. Fuel	30¾ - 33⅛	Va. I. C. & Coke	40
Deere & Co., pref	90¼	West'gh'se Elec.	96¾ - 101
General Elec.	162½ - 172½	Am. Ship, com.	34 - 38
Gt. No. Ore Cert.	34⅞ - 36⅞	Am. Ship, pref.	70
Int. Harv. of N. J., com.	102 - 102½	Chic. Pneu. Tool.	57¾ - 58
Int. Harv. Corp., com.	63½ - 64	Cambria Steel	48 - 49⅛
Lacka. Steel	44 - 46	Lake Sup. Corp.	6 13/16 - 11⅝
Nat. En. & Stm., com.	17½ - 18½	Pa. Steel, pref.	57¾ - 58
Nat. En. & Stm., pref.	85	Warwick	9⅝
Pressed Stl., com.	47¼ - 50	Cruc. Steel, com.	29¼ - 29¾
		Cruc. Steel, pref.	88½ - 89½
		Harb.-Walk. Refrac. pref.	98½ - 99
		LaBelle Iron, pref.	103

Dividends

The American-La France Fire Engine Company, regular quarterly, 1¾ per cent on the preferred stock, payable July 1.

The American Screw Company, regular quarterly, 1½ per cent, payable June 30.

The Pittsburgh Coal Company, regular quarterly, 1¼ per cent on the preferred stock, payable July 24.

The Chicago Railway Equipment Company, regular quarterly, 1¾ per cent on the preferred stock, payable July 1.

The Westinghouse Air Brake Company, regular quarterly, $2 a share, payable July 15.

The Union Switch & Signal Company, regular quarterly, $1.50 a share on the common and preferred stocks, payable July 15.

Manganese Ore Imports Increasing

Manganese imports into the United States, after dwindling to very small proportions in February, March and April, came up to 16,645 gross tons in May. In January of this year these imports were 9849 tons, in February 27 tons, in March 398 tons, and in April 218 tons. For the eleven months ending with May the total imports were 175,848 tons, compared with 266,245 tons for the corresponding period in the fiscal year 1914 and 378,499 tons for the eleven months ending May 31, 1913. Two cargoes of manganese ore amounting to 4170 tons, presumably from Brazil, are reported as arriving in Baltimore in the past week. Six more vessels carrying the ore are said to be on their way from Brazil to that port. One cargo of Cuban manganese ore was received at Sparrows Point in the past few weeks.

The American Propeller Company, 249 East Hamburg street, Baltimore, Md., is being kept very busy turning out propellers for aeroplanes to be shipped to the Allies. It is expected the output will reach 30 propellers a day in the near future.

CRANE COMPANY ANNIVERSARY

A Business Dominated for 57 Years by One Man —The New Corwith Works

July 4 will mark the sixtieth anniversary of the Crane Company. No more striking evidence of the growth of the company could be presented than is had from a comparison of the one-story frame shed in which R. T. Crane started the R. T. Crane Brass & Bell Foundry with the plant which is just being finished at Corwith, for the consolidation of all the Chicago operations. The Crane Company has come to be one of the pre-eminent, specialized businesses of the country, and its growth from the day when Mr. Crane personally delivered his first casting, having made the mold, melted the metal and poured it himself, is a tribute to the energy and consistency with which the business policy of the company has been pursued.

Organized July 4, 1855, under the above name, the company's first orders were for brass couplings for lightning rods and copper lightning rod tips. In the autumn of the first year Mr. Crane took into partnership his brother, Charles Crane, also a practical molder, and the first addition to the plant, consisting of a foot lathe for finishing brass, was made. Soon after, the original structure becoming inadequate, a room was rented with power and several lathes were installed, the first building continuing to be used as a brass foundry. In 1856 a lot was purchased in West Lake Street and a three-story frame building constructed. The company, now known as R. T. Crane & Brother, began to seek trade outside of Chicago, and in the following year the jobbing of wrought pipe and fittings was undertaken and a beginning made in steam heating.

In 1858 the firm secured its first large steam-heating contract, the heating of the new Chicago Court House. It was in connection with this job that the opportunity first presented itself of beginning the manufacture of valves and fittings, and in 1862 an enlargement of the West Lake Street shop, with the addition of an iron foundry in North Jefferson Street, permitted an extension of the company's operations to include the making of machinery and pumps.

In 1864 the company built the first pipe mill west of Pittsburgh, operating it continuously until 1905, and also built the first malleable iron foundry west of Pittsburgh. Subsequently the various branches of the company's operations were consolidated in the building at 10 North Jefferson Street. Upon the completion of this enlarged plant a beginning was made of manufacturing a full line of fittings, both in gray iron and malleable iron, and of the designing of the special machinery for tapping and threading which now enters so largely into the company's equipment. As the business in valves and fittings grew, the manufacture of machinery, engines, pumps and general jobbing was discontinued.

In 1865 the firm was incorporated as the Northwestern Mfg. Company and in 1867, having undertaken the manufacture of elevators, the Crane Elevator Company was incorporated to operate independently in a building constructed for the purpose in South Jefferson Street. This elevator business was continued until 1895, when it was disposed of, leaving the building subsequently to be occupied by the Crane Company. In 1872, although Charles Crane had retired from the business in the preceding year, the name of the company was again changed, this time to Crane Brothers Mfg. Company, and in 1874, finding that it was competing with its own customers for valves and fittings, the company withdrew from the steam heating business.

CORWITH WORKS PROVIDES FOR 49 BUILDINGS

The first of the factory buildings of the group which later extended from Twelfth to Fifteenth streets along Canal Street, and which are now being abandoned to make way for railroad terminals, was erected in 1881 to house a new pipe mill. The name Crane Company was adopted in 1890. Since that time its business has grown with great rapidity, largely because of the progressive policy of the company in adopting the latest facilities for manufacturing and in taking advantage of information gained through investigation of its operation from metallurgical and operating standpoints. New construction of a very modern and substantial nature undertaken as late as 1909, when the company began the erection of fireproof factory buildings with a new malleable foundry at Fifteenth and Canal streets, and a similar building for the brass department at Canal Street and Twelfth Place, is now being abandoned for the consolidation which will become effective with the operation of the new Corwith works this year. The site for the new plant comprises an undivided quarter-section in the manufacturing district of the southwest portion of Chicago. A complete plan of the works provides for 49 buildings with a total floor area of 50 acres. Of these, 27 buildings are now completed. The buildings are uniformly of two stories, 500 ft. long and 80 ft. wide, and the cost of the plant at present has been approximately $3,000,000. To complete the buildings will require another $3,000,000, while the cost of equipping the works will bring the total investment up to $8,000,000.

In 1903 a radical step was taken in the development of the company through the purchase of the long established business of Eaton, Cole & Burnham at Bridgeport, Conn. This plant was greatly enlarged and was operated for many years as the Crane Valve Company. The name was recently changed to the Bridgeport Division of Crane Company, and, at the West End works of this division, new construction has been pursued along the same general plan as has been adopted for the new Corwith works. For this division 85 acres are available for expansion.

R. T. Crane was the first president of the company and remained continuously in that position until his death in 1912. At all times he was the conspicuous figure about which the business of the company revolved. Following his death his son, Charles R. Crane, was made president, but served for only two years, being succeeded by R. T. Crane, Jr., the present executive.

Large Foreign Orders for Locomotives

Belgium is reported to have ordered 20 locomotives and Brazil 6 from the American Locomotive Company, and France 64 from the Lima Locomotive Corporation. These 90 locomotives added to the 450 ordered by Russia recently—250 from the Baldwin Locomotive Works, 100 from the American Locomotive Company, 50 from the Lima Locomotive Corporation and 50 from the Canadian Locomotive Company—make a total of 544 foreign locomotives, 494 being placed with American builders. Bulgaria is also reported to be inquiring for 10 locomotives, and the Italian State Railways for a small number, understood to be preliminary to the buying of extensive railroad equipment in this country. Domestic railroads have bought 16 locomotives lately. June orders exceed those for a single month in a long period.

Prime Steel Company Fails

The Prime Steel Company, Milwaukee, Wis., operating open-hearth and crucible steel works in the manufacture of castings, filed a voluntary petition in bankruptcy June 23, Charles J. Wild, secretary, signing the petition. The liabilities are scheduled at $256,533 and assets at $526,098. The assets include real estate, $315,598; machinery and tools, $129,106; due on open accounts, $54,736; stock on hand, $17,851, and cash on hand, $7.40. Julius J. Goetz was appointed receiver.

Fairbanks, Morse & Co., machinery manufacturers, will open a new branch at the corner of Franklin and Oliver Streets, Boston, Mass., July 1. This will serve the New England States and will be in charge of R. F. Koops, formerly manager of the Springfield (Mass.) office. Practically a full line of the company's products will be displayed and some stock carried.

American Foundrymen's Annual Meeting

A partial list of the papers to be presented at the annual meeting of the American Foundrymen's Association at Atlantic City, during the week of Sept. 27, is given below. Besides these, reports will be submitted from committees on steel foundry standards, specifications for malleable castings, specifications for gray-iron castings, specifications for steel castings, specifications for foundry scrap, safety and sanitation, industrial education, and foundry costs.

"Resume of Advances in Foundry Practice," by Dr. Richard Moldenke, Watchung, N. J.

"Application of Various Types of Molding Machines to Different Classes of Work," by J. J. Wilson, General Motors Company, and A. O. Backert, secretary of the association.

"Time Studies on Molding Machines," by H. K. Hathaway, consulting engineer, Philadelphia.

"Functions of Sand Binders," by H. M. Lane, H. M. Lane Company, Detroit.

"The Reclamation of Molding Sand," by W. M. Saunders and H. E. Hanley.

"Relation of the Foundry Foremen to the Manager," by S. Y. Blair.

"Manufacture and Constituents of Pig Iron and the Essentials in the Purchase of this Material," by O. J. Abell, THE IRON AGE, Chicago.

"Pouring Systems for Gray-Iron Shops," by H. Cole Estep, *The Foundry*, Cleveland.

"Fuel Oil Cupolas," by Bradley Stoughton, secretary American Institute of Mining Engineers, New York City.

"Thermal Reactions in Melting Gray Iron," by Dr. Joseph Richards, Lehigh University, South Bethlehem, Pa.

"The Inspection of Automobile Castings," by C. B. Wilson, Pontiac, Mich.

"Defects in Gray-Iron Castings and Remedies for Them," by Herbert Ramp, Cincinnati.

"The Value of the Vibratory Test in Steel Foundry Practice," by Lloyd Uhler, metallurgist Union Steel Castings Company, Pittsburgh.

"The Particular Application of the Converter in the Manufacture of Steel Castings," by C. S. Koch, president Fort Pitt Steel Casting Company, McKeesport, Pa.

"Notes on Electric Furnace Construction and Operation in the Steel Foundry," by John H. Gray, United States Steel Corporation, New York City.

"Correct Proportions and Essentials in Checker Design for Open-Hearth Furnaces," by W. A. Janssen, Bettendorf, Iowa.

"Causes for Shrinkage Cracks in Steel Castings," by William Bossinger, Marion, Ohio.

Book Review

The Model T Ford Car: Its construction, operation and repair. By Victor W. Pagé. Pages 300, 5 x 7 in. Cloth. Over 100 specially made engravings and 2 large folding plates. Published by the Norman W. Henley Publishing Company, 132 Nassau street, York City. Price $1.

The very large number of Ford automobiles in use has prompted the author of this book to bring out a volume dedicated exclusively to this one style of car. It is a unique conception, one that could scarcely be conceived in connection with any other make of automobile, and will doubtless be appreciated by thousands now operating what the author terms "the universal car." He is a recognized automobile engineering authority, has driven and repaired Ford cars for a number of years, and hence is an expert on this particular construction. All repair processes are illustrated and fully explained. The parts of the car are described in detail, the operating principles being made thoroughly clear. Complete instructions for driving are also given.

The same publisher has also issued a large chart, 25 x 38 in., entitled "The Location of Ford Engine Troubles Made Easy," which is to be had at 25 cents per copy. It will be found exceedingly useful.

The plant of the L. S. White Forging Company, Endicott, N. Y., has been purchased by Thomas A. MacClary, who is a director and secretary of the Globe Malleable Iron & Steel Company and an application is being made for incorporation in the name of the Endicott Forging & Mfg. Company. The new company will continue the L. S. White standard line and will also do a general drop forging business.

A Bust of Henry W. Oliver in the McKinley Memorial Building

J. G. Butler, Jr., Youngstown, Ohio, president of the National McKinley Birthplace Memorial Association, states that Mrs. Henry R. Rea, of Pittsburgh, a daughter of the late Henry W. Oliver, has arranged to have a bronze bust of her father placed in the McKinley Birthplace Memorial Building at Niles, Ohio. It will be similar to those which will commemorate the late James Ward, Senator Hanna and B. F. Jones. Mr. Oliver, for many years a foremost iron and steel manufacturer in Pittsburgh, and one who did much to build up the steel industry in this country through his great activity, notably in the development of the Mesaba iron range, was a self-made man and he displayed rare ability as a manufacturer and railroad financier. Although he met with severe reverses in the course of his business life, he died a very wealthy man. For a few years prior to his death he made heavy investments in real estate in Pittsburgh, and the Henry W. Oliver Building on Smithfield Street, the largest office building in Pittsburgh, was erected by his estate. Mr. Oliver was very active in the building of the Pittsburgh & Lake Erie Railroad, which runs from Pittsburgh to Youngstown. He was also actively identified with other railroads and was heavily interested in the Oliver Wire Company, now a part of the American Steel & Wire Company, and in the Monongahela Tin Plate Company, now owned by the American Sheet & Tin Plate Company. He was president of the Oliver & Snyder Steel Company for many years. Mr. Oliver was also active in the development of ore properties on the Mesaba, Marquette and other ranges. He was public spirited to a high degree and took an active interest in politics. For three years he was president of the Common Council of Pittsburgh, and was a delegate to four Republican national conventions.

Pacific Coast Machinery Dealers Meet

The Pacific Coast Machinery Dealers' Association held its fifth annual meeting June 18 and 19 at San Francisco, with twenty-one officers of coast machinery firms in attendance. Papers were read as follows: J. A. Nickell, Smith-Booth-Usher Company, Los Angeles, on "Comparative Costs of Doing Business." By H. G. Mitchell, Harron, Rickard & McCone, San Francisco and Los Angeles, on "Credits and Collections." F. F. Prendergast, Terry Engineering & Supply Company, Los Angeles, on "Machinery Advertising."

The opening address, which was a comprehensive review of business conditions on the coast and the outlook for the future, was made by Eldridge S. Green, General Machinery & Supply Company, San Francisco, who was the retiring president of the association. The officers for the coming year are as follows: President, J. A. Nickell, Smith-Booth-Usher Company, Los Angeles; vice-presidents, John A. Beall, Coast Culvert & Flume Company, Portland; H. G. Mitchell, Harron, Rickard & McCone; E. S. Green, General Machinery & Supply Company, San Francisco; secretary and treasurer, C. F. Bulotti, Eccles & Smith, Portland, San Francisco and Los Angeles; assistant secretary and treasurer, John W. Berger, 410 Market Street, San Francisco. The concluding event was a banquet at the Cliff House.

California Ferromanganese Shipped East

Advices from San Francisco are that the Noble Electric Steel Company has very recently shipped two carloads, or about 60 tons, of ferromanganese produced at its plant at Heroult, Shasta County, Cal. The purchaser is understood to be an eastern Pennsylvania steel works and the price $100 per ton, f.o.b. The San Francisco company, it is stated, is now in a position to provide all the ferromanganese needed on the Pacific coast, as a second furnace is to go on ferromanganese. Two other furnaces are to make ferrochrome, for which the price is $200 a ton. The fifth furnace will be held in reserve. Ore for the manufacture of ferromanganese is being brought from Mendocino County, Cal.

Foreign Rail, Wheel and Axle Specifications

A Bureau of Standards Compilation of Details of European Practice, Also Data on Number and Causes of Railroad Accidents

WASHINGTON, D. C., June 29, 1915.—As an important feature of the program of the Bureau of Standards relating to the determination of the causes of failure of railroad materials, including rails, wheels, axles, etc., as authorized by Congress, it was recently decided to ascertain the European practice with respect to specifications for and tests of such types of material, together with any information available concerning the prevalence of accidents abroad caused by failure of railroad equipment. The co-operation of the State Department was solicited and the governments of Austria-Hungary, Belgium, France, Germany, Great Britain, Holland, Italy, Russia and Sweden were asked to furnish information relating to "the laws, regulations or specifications now in force, and when adopted, covering the processes of manufacture and methods of inspecting and testing of wheels and axles for freight and passenger cars and locomotives, and what types and sizes of wheel and axle are used or permitted for the several classes of service; analogous information concerning rails; statistics as to the number of derailments and their causes as apportioned among defective wheels, axles, rails and other defective equipment or permanent way."

As a result of this inquiry the bureau obtained a large amount of data which have been carefully studied by Dr. G. K. Burgess, chief metallurgist, and Dr. P. D. Merica, physicist, and the results embodied and condensed into a summary, the chief features of which the correspondent of THE IRON AGE is enabled to present herewith. The bureau officials express the hope that the information thus obtained may be of interest and service to the railroads and manufacturers of railroad material in the United States, in that it gives an opportunity to compare American and European practice for some of those portions of railroad equipment most subject to failures which may cause accidents.

For purpose of comparison, data relating to the number and cause of accidents embodied in the foreign reports are presented, together with some figures for the United States, taken mainly from the reports of the Interstate Commerce Commission. The foreign figures are evidently, in many cases, incomplete and the basis of computation is not a common one for the various countries, so that strictly exact numerical comparisons with the American figures cannot be made. Nevertheless, there is sufficient information available to draw some fairly trustworthy conclusions concerning the relative prevalence of accidents due to faulty equipment abroad and at home.

ACCIDENT COMPARISON UNFAVORABLE TO UNITED STATES

The number of failures would be expected to bear some relation to the density of traffic, both passenger and freight, unless there existed a marked difference in quality of material in going from one country to another. The railroads of Great Britain and Ireland, for example, carry in one year over 3,000 million passengers and 520 million tons of freight, with only 24 derailments from all causes which injure persons in a total mileage of only 23,200, and injure but 209 persons, of whom 13 are killed. For the same period in the United States there are carried a third as many passengers, or 1,004 millions, and somewhat over three times the freight—1,844 million tons—over 183,000 miles of track; but there are from 4000 to over 5700 derailments, in which 5000 to 7500 persons are injured.

The figures gathered also embrace the number of derailments per million passengers carried and per thousand miles of track for the countries for which these data are available, namely, Austria, Germany, Great Britain, and the United States. They show 26 times as many derailments per mile of track for the United States as for Great Britain, and three times as many as for Germany, but only one-third the Austrian record. In terms of passengers carried, the Austrian and American derailments are not very different, but the American are nearly 600 times the British and 24 times the German. An inspection of the statistics shows also low accident or derailment figures for France, Russia and Sweden, there being, for example, about 0.5 passengers injured per million in France as against 7.5 for the United States, due to derailments.

There appear to be no foreign statistics available concerning the removal for defects of rails, wheels and axles. Such statistics would be of interest as giving a measure of quality of each type of material or equipment for the service intended. Such data for the United States could perhaps be obtained from the records kept by the railroads, and in fact is available for rails in the reports of the American Railway Engineering Association. From these it appears that there were removed from the tracks in 1911 for defects 36,641 rails for 12,688,714 tons laid, and in 1912 61,047 failed rails for 13,736,956 tons, or in 1912 there was a potential accident for 1 in about every 470 rails in the track in the United States, which possible accident was presumably prevented only by the track inspection service of the railroads. That there were, nevertheless, 363 derailments caused by defective rails in 1912 and 1255 caused by wheels, and a total of 5724 derailments in one year caused by defective equipment or track, points to the desirability of examining the question of the improvement of specifications and tests of at least some of the railroad material the failure of which may cause accidents.

It was with the object of putting the European practice in these matters before those in the United States interested in and responsible for railroad matters that these foreign specifications have been secured and digested. The European practice is believed to be of interest, for one reason among others, in that the foreign railroad material—such as rails, wheels and axles—appears to perform the duty imposed upon it in a more adequate manner, generally speaking, than is the case in this country. Yet, as is brought out below, the loads there are much less than in the United States.

SOURCES OF SPECIFICATIONS CONSIDERED

In examining the specifications for railroad materials, including rails, axles, tires and wheels, secured from Great Britain, Italy, France, Belgium, Germany, Austria, Holland and Sweden, it is noted that these specifications fall into groups, one group being formed by Great Britain, one by France, Italy and Belgium, and another by Germany, Austria, Holland and Sweden. The variations in the specifications within each group are less marked than those between groups.

The railroads of the different countries of which specifications are given here are differently organized, and whereas in one case these specifications may be issued by the government itself through its railroad administration, in other cases the specifications are no concern whatever of the government, but are drawn up and issued solely by the privately owned railroads.

In Great Britain the railroads are all privately owned, and each railroad naturally issues its own specifications. Nevertheless, approximately 60 per cent of the construction by railroad companies conforms to the specifications published by the Engineering Standards Committee, a semi-official organization supported by voluntary associations and by the government. And when these specifications are not followed by the rail-

roads, those issued by the latter conform more or less closely to them.

In 1907 the Railway Clearing House drew up some specifications for the construction of "Private Owner's Waggons," and while these hold primarily for freight cars owned by private firms or individuals, it is stated by a general manager of one of the English railroads that these are adhered to generally by the railroads in the construction of their own cars.

In Italy the railroads are practically all owned and administered by the state and specifications are drawn up and issued by the State Railway Administration.

In France the railroads are privately owned, with the exception of the Western railways and a southern line comprising the State Railway System, and specifications are issued by each of these. Since 1901, however, much effort has been made to unify these specifications, so that with few exceptions there exist French standard or unified specifications for such equipment.

The railroads of Belgium are practically all state railroads and the bureau has obtained the specifications of the State Railway Administration.

The railroads of Germany are practically all state owned; that is, they are for the most part owned and operated by the various German states. Specifications issued for the Prussian and Prussian-Hessian railroads have been obtained, together with those of the several associations, official or semi-official, such as the Association of German Railway Administrations and the German State Railway Car Administration.

The railroads of Austria are also practically all state owned and the specifications of the Austrian Government for all forms of railroad material have been obtained.

In Holland the railroads are all privately owned, and the specifications studied in this connection are those issued by four of the largest railroad companies in Holland.

About one-half of the Swedish railroads are state owned, and the specifications here considered are those issued by the Royal Administration of State Railways.

TYPES OF RAILS AND ROLLING STOCK

It is generally known that the service conditions to which rails, wheels and axles are subjected in the United States are in many respects more severe than in Great Britain or Europe. The rolling stock is generally lighter abroad, although the tendency has been in recent years in the direction of heavier equipment; and the rails are practically as heavy as American rails, or relative to the service they are, in general, much heavier.

In Great Britain under the specifications of the Engineering Standards Committee, both "bull-head" and flat-bottom rails are employed, ranging in weight from 50 to 100 lb. per yd. The Italian State Railways employ rails ranging from 73 to 105 lb. In France the Eastern Railways use 94-lb. rails, the Northern Railways 92-lb. rails, the State Railways 93 and 94-lb. rails and the Paris, Lyon & Mediterranian Railroad 98-lb. rails. In Belgium the State Railways use rails ranging from 82 to 133 lb. In Germany the specifications have varied in different years. In 1890 92-lb. rails were called for; in 1898 87-lb. rails were specified, while in 1911 both 93.5-lb. and 98.5-lb. rails were used. In Austria the State Railways in 1911 used 73 and 86-lb. rails, but in 1912 the weight was increased to 90 lb. In Holland the Central Railroad in 1892 specified 82-lb. rails, while in 1912 94-lb. rails were used. In Sweden the State Railways in 1896 used 83-lb. rails, while in 1899 the specifications called for 70-lb. rails.

It is very difficult to define in any way the severity of the service to which railroad material is subjected, but some idea of it may be gained from a consideration of the dead weights and capacities of types of rolling stock.

Great Britain.—The dead weight of locomotives appears to range from 45 to 65 tons, while the weight per axle ranges from 15 to 17 tons. The dead weight of freight cars is given as ranging from 10 to 15 tons and the freight car capacity as averaging 15 tons.

France.—Two sets of figures are presented for French rolling stock. According to the first set the dead weight of locomotives ranges from 45 to 65 tons, the weight per axle of locomotives from 15 to 18 tons, the total weight of passenger cars approximates 15 tons, and the weight per axle 7 tons, while the dead weight of freight cars ranges from 6 to 7 tons, and the freight car capacity averages 13 tons. The second series of figures, representing data gathered at the Ghent exposition of 1913, gives the dead weight of locomotives as ranging from 50 to 92 tons, the weight per axle as ranging from 11 to 18 tons, the total weight of passenger cars 36 tons, the weight per axle of passenger cars 8 tons, the dead weight of freight cars 10 tons, and the capacity of freight cars from 15 to 18 tons.

Germany.—German locomotives range in weight from 45 to 65 tons; the dead weight of freight cars is given as ranging from 10 to 15 tons and the capacity of freight cars as averaging 15.5 tons. No other data are presented for Germany.

Belgium.—From figures gathered at the Ghent exposition of 1913, it appears that Belgian locomotives range from 50 to 92 tons in dead weight, while the weight per axle ranges from 11 to 18 tons. The total weight of passenger cars is given at 15 tons and the weight per axle 7 tons, while the dead weight of freight cars is 10 tons and the capacity of freight cars 15 to 18 tons.

The weights of axles and wheels have been obtained from France and Austria. Often the size of equipment, such as wheels or axles, is prescribed by setting an upward limit to the static stresses that may be developed in any part. For instance, the railroads of France prescribe generally, directly or indirectly, a maximum wheel load of from 16,100 to 16,800 lb. The German laws prescribe, for example, a maximum static stress of 10,000 lb. in the journal of freight car axles, and of 7,900 lb. for passenger car axles. The data obtained from France cover the Eastern Railways and show a weight of axle ranging from 564 to 764 lb. The weight of wheel and tire on these railroads is reported as 910 lb. Reports for the State Railways of Austria give the weight of axle as 560 lb. and of wheel and tire as 910 lb.

RAIL SPECIFICATIONS

All foreign specifications call for steel rails, although the kind of steel desired is not generally defined chemically with great accuracy. In some cases even the carbon content, apparently, is not specified. As characteristic of the process of manufacture certain items of interest are here considered.

Size of Ingot.—Several of the 12 sets of rail specifications obtained by the Bureau specify the size of the ingot from which the rails shall be rolled. These are from Great Britain, the Italian State Railways, the Belgian State Railways and those of the Holland Railway.

Discard.—Most of the specifications call for a discard to be made after rolling. Those of Great Britain, the Northern Railroad (France), the Paris, Lyon & Mediterranean Railroad (France), the Belgian Railways, and of the Holland Railway specify that enough discard be taken to insure soundness in the rail, while those of the Italian railroads, the French State Railways, the Eastern Railways (France), and the Swedish State railroads require a definite amount of discard, which varies from 1.5 to 2.5 meters of the rail bar from the upper part of the ingot.

Gagging.—All the specifications require that gradual application of the pressure be made in the process of cold straightening.

Finishing of the Rail Ends.—All of the specifications but those of Great Britain, the Swedish State Railways, and the Eastern and Northern Railways (French) state that the rail ends must be machine finished, milled or otherwise.

Tests and Making of Test Specimens.—Ultimate strengths varying from 80,000 lb. per sq. in. to 112,000 lb. per sq. in. are called for, with elongations of from 15 to 18 per cent. In some cases the values for the ultimate strength and the elongation must stand in some prescribed relation. In only one case is the yield point specified.

The bending test required is a static one and generally consists of two parts. At first a span of the rail is loaded at the center with a load which is not supposed to bend the rail permanently. Thereupon a load is applied under which it may yield but very slightly, the maximum amount of deflection at the center being prescribed.

The drop test is carried out with a drop testing machine which consists of an anvil of 10,000 kg. embedded in a mass of masonry 1 m. deep and 3 sq. m. in area. The hammer varies in weight from 600 to 2,000 lb. and its weight is not specified in the German, Austrian and Dutch specifications. The British, Eastern Railways (French), Paris, Lyon & Mediterranean Railways, and the Belgian specifications call for one heavy blow, whereas the others, particularly those of the German group, call for numerous lighter blows.

SPECIFICATIONS FOR AXLES

Axles are specified to be of steel, of which the chemical composition is not specified, the only reference being to the phosphorus content and to the nickel content required for locomotive crank axles. Very often the cross-section of the ingot from which the axle is forged is specified; that is, it is required to be four or five times that of the finished axle. The axles are generally, although not always, required to be annealed after forging, and locomotive axles must generally be quenched and oil-tempered.

The values required in the tensile test vary from 64,000 lb. per sq. in. to 95,000 lb. per sq. in. for the tensile strength and from 15 to 25 per cent for the elongation. In a few cases the yield point is required to be from 40 to 50 per cent of the ultimate strength.

The drop test is carried out both on the body of the axle and on the journal; the weight of the hammer used is specified (2,000 lb.) only in two or three cases. In all but one set of specifications several (5 to 8) blows are struck, and the axle is generally turned so that the blows are not all applied in the same direction.

In many cases a fracture test is required. For this purpose an axle of excess length is required; that is, notched at one end and the excess length broken off in the drop testing machine. The fracture must be sound and homogeneous.

SPECIFICATIONS FOR WHEELS AND TIRES

Many types of car and locomotive wheels are used abroad. The chilled cast-iron wheel, the type most used in the United States for freight service, is not generally used, and is very seldom mentioned in foreign wheel specifications. It is allowed on German and Swedish railroads for unbraked wheels on freight cars which run at limited speeds (45 km. or 28 miles per hour). The type most generally used is a combination of wheel center of steel, cast or rolled, or wrought iron, with a shrunk-on steel tire. The wheel centers may be of the plate or of the ribbed or spoke type.

Tires are to be of steel, forged and rolled into the desired shape. In the tensile test values are required varying from 85,000 lb. per sq. in. to 124,000 lb. per sq. in. for the ultimate strength in tension, and from 8 to 18 per cent elongation.

Two types of drop test are required. In the first, required in British specifications, each tire is dropped upon a rail fastened in an iron block. In the second type, required by all of the specifications, a fall hammer is used, the tire being supported on a block with its plane vertical. It is in some cases required merely that the tire will not fracture or fissure under repeated blows of given energy; but in some cases (German and Austrian railroads) it must be possible to flatten the tire by 12 per cent without any cracks appearing. The weight of the fall hammer is usually about 2,000 lb. and the blows of about 20,000 ft.-lb. of energy.

A static flattening test is also required in several cases. The amount by which the diameter of the tire is required to be reduced without failing is generally about 17 per cent.

WHEEL CENTERS

Wheel centers are made of forged and cast steel and of wrought iron. They are generally required to be annealed after being cast or forged. In the tensile test values of the ultimate strength are required varying from 52,000 lb. per sq. in. to 91,000 lb. per sq. in. and values of the elongation from 15 to 20 per cent.

Each wheel center must be equilibrated and a limit is set upon the amount of variation from the state of being perfectly centered.

In the transverse bending test, the wheel center is supported flat at two opposite points of the rim, and pressure is applied at the hub parallel to the axis of the wheel. The wheel must allow of the hub being lowered by about 4 per cent of the diameter of the wheel.

In the hub expanding test cylindrical wedges of conicity 1 to 100 are introduced into the bore of the hub until one end has been expanded by about 5 per cent. This test must be passed without any fissuring at the hub.

Two types of drop test are applied. In one the wheel center itself is dropped upon an anvil; in the other, which is carried out on test pieces from the wheel center, a fall hammer is used.

The Austrian specifications require that the bending test be made by impact.

GUARANTEES FOR MATERIALS

Service guarantees are required in several specifications for all of these materials. Rails are often, for example, required to be guaranteed against failure which can be considered as due to the manufacture or material for a period of six years.

This is the rule in France, where axles must be guaranteed for 50,000 miles for passenger carriages and freight cars. Other French specifications call for an endurance of 30,000 miles in three years and other specifications for 62,000 miles in four years. In Belgium axles and tires must be guaranteed for three years and wheels for two years. In Germany rails are guaranteed for five years and freight car wheels for three years. In Austria the rail guarantee is five years and that of wheels four years. In Holland rails are guaranteed for five years and axles for 103,000 miles, while the guarantee on wheels and tires is three years.

CONCLUSIONS

In conclusion a few points of general practice may be touched upon. It is noticed that almost without exception the foreign specifications cited rely upon physical tests alone rather than upon chemical analyses or both chemical analyses and physical tests for their information concerning the various materials. Only phosphorus and occasionally sulphur seem to have engaged the attention of those drawing up the specifications. The physical tests always include stringent toughness or brittleness tests, which of course somewhat lessen the necessity of chemical analyses.

With the exception of Holland and Austria the specifications cited require that free access to the shops and plants of the manufacturer be granted to agents of the railroads at the time material for the latter is being manufactured.

The practice in regard to indicating the method of manufacture is not uniform. In some cases this is almost entirely left to the manufacturer (Germany) who must, however, state in his bids what method will be used. In many cases upen-hearth steel is specified, particularly for axles; in others both Bessemer and open-hearth material is allowed as, for example, rails. In some cases nothing is mentioned regarding the method of manufacture of the material.

In most cases the mode of manufacture of the article is given in its general details—as, for example, to specify that a wheel center shall be of cast steel, or of forged or rolled steel, afterwards annealed.

It is the purpose of the Bureau of Standards ultimately to print in pamphlet form the synopsis above presented, together with the complete text of the specifications referred to, in order that they may be rendered available for examination by railroad managers and manufacturers of railroad equipment. W. L. C.

At the Gary, Ind., plant of the Indiana Steel Company, all the eight blast furnaces are now in operation. In the past week 32 open-hearth furnaces were operated.

Pittsburgh and Nearby Districts

The Standard Tin Plate Company, Canonsburg, Pa., which will add 12 hot tin mills to its plant, has placed a contract for the structural steel buildings, requiring about 2000 tons of steel. The company has inquiries out for three 15-ton, one 10-ton and one 20-ton electric cranes. It will place contracts for all the equipment needed as fast as possible.

The Farrell open-hearth steel plant of the Carnegie Steel Company is in operation this week to full capacity, with the exception of the skelp mill, which is expected to start July 6. Two of the three blast furnaces at Farrell are in operation and the third is to be started shortly. The blast furnace at North Sharon was started June 24, having been idle since November, 1913.

The Asbestos Protected Metal Company, First National Bank Building, Pittsburgh, works at Beaver Falls, Pa., has closed a contract with Bailey, Lush & Co., general contractors, Philadelphia, for the supply and erection of all corrugated asbestos protected metal roofing, louvers, ventilators, skylights and other sheet metal work for the cattle storage buildings at Herrs Island, Pittsburgh, to be built for the Pennsylvania Railroad. The work is now under way. It has also closed a contract for the supply and erection of large quantities of asbestos protected metal corrugated roofing and siding for the plant of the Aetna Zinc Company, Carnegie, Pa., for which Mackintosh, Hemphill & Co., Pittsburgh, have the general contract.

The Gem Mfg. Company, whose plant was formerly located on Spruce Street, Pittsburgh, is now occupying its new building on the corner of Ridge Avenue and Fulton Street, North Side. The company has erected a two-story building, 136 x 136 ft., and has more ground available for extensions. The building is of buff brick and is of the "daylight" style, having windows on all four sides with steel sash, giving a maximum amount of light and ventilation. The offices are located on the second floor, and later on the remainder of this floor will be used for an assembling room. The company uses electric power throughout, part of its machinery being driven by individual motors and part by line shafting. It has installed a complete brazing outfit for doing all kinds of brazing work, also a number of Bliss blanking and drawing presses, punches and lathes. Its products are the Gem oil cans, railroad and factory torches and flexible shafting. It is also prepared to do special stamping work and to manufacture light articles of various kinds.

The William B. Pollock Company, Youngstown, Ohio, is turning out an order for 10 large valves for the gas producers of the new open-hearth steel plant of the Youngstown Iron & Steel Company. Each of these valves weighs several tons. The company is also shipping frames and stills for a by-product coking plant of the Koppers type being built for the Allegheny By-Product Coke & Gas Company, Glassport, Pa., and has recently shipped two large ladles of special design to the Broken Hill Proprietary Company, New Castle, Australia. The W. B. Pollock Company built about a year ago the blast furnace now being operated by the latter.

The Ohio Pail Company, Middlefield, Ohio, is building an addition to its plant to manufacture inside liners for its 5-gal paint kits. The company will not go into the manufacture of tin cans as reported.

All the steel plants and finishing mills in the Youngstown district will close down on Saturday, July 3, and remain idle until Tuesday morning, July 6. Mills in the district report a continued heavy demand for open-hearth billets and sheet bars, and the local open-hearth capacity is being operated close to 100 per cent. The Brier Hill Steel Company will close its two large sheet mills at Niles the week commencing July 4 in order to make needed repairs, but its open-hearth steel plant at Youngstown will continue in operation. The plant of the Deforest Sheet & Tinplate Company at Niles has been closed for a few days on account of a broken flywheel.

The Brakeless Staybolt Company, Pittsburgh, has been granted a Delaware charter, with a capital of $300,000, the incorporators being Robert J. McKay, J. Albert McKay and Thomas J. McKay. It has taken over the business of the Flexible Bolt Company, Pittsburgh, and has brought out a new design of staybolt which, it is stated, is meeting with good success. The staybolts are manufactured by the James McKay Company, chain manufacturer, which is an identified interest of the Brakeless Staybolt Company.

The new plant of the Alloy Steel Forging Company, Carnegie, Pa., has been started. The main building is of steel, 100 x 300 ft., and has two 25-ft. bays and one 50-ft. bay. This company manufactures woven manganese steel screens, made double crimp and of its own special design, with one side smooth, like perforated plates, and has square and rectangular openings. The company also makes a full line of light alloy steel forgings.

On account of the very heavy demand for billets and sheet bars the Youngstown Sheet & Tube Company, Youngstown, Ohio, which now has six 100-ton open-hearth furnaces, may start the erection of more furnaces in the near future. In its recent plans for extensions the company did not contemplate erecting more open-hearth furnaces at this time, but is now seriously considering doing so. Definite plans have been made for an office building to cost about $300,000, a laboratory building to cost about $100,000, and a new hospital to cost about $75,000.

The H. Koppers Company, First National Bank Building, Pittsburgh, has just completed a Koppers by-product coke plant for the Laclede Gas & Light Company, St. Louis, Mo., containing 56 ovens, the first coke having been drawn on Thursday night, June 24. The coke manufactured will be sold mostly for foundry and domestic purposes, while the gas will be piped by the company through its mains and supplied to customers for lighting and heating urposes.

From time to time improvements will be made to the stoves at the Edgar Thomson blast furnaces of the Carnegie Steel Company, in some cases amounting to reconstruction, appropriations for this work having been already voted.

The City Council, Youngstown, Ohio, has agreed on an issue of $100,000 of bonds to complete waterworks improvements.

The Wayne Brass Foundry Company, Pittsburgh, has recently purchased some property adjoining its present plant on which it will erect storage and pattern shop buildings.

W. L. Bessolo, box 525, Leechburg, Pa., has opened an office and plans to erect a factory for the manufacture of a patented pipe wrench.

Saltsburg, Pa., will receive bids until July 12 for furnishing a 500,000-gal. pump. Robert H. Wilson is chairman of the water commission.

New Process Gear Corporation Expands

The capital stock of the New Process Gear Corporation, Syracuse, N. Y., has been increased from $1,000,000 to $3,000,000. The stockholders at the last annual meeting subscribed $600,000 of the new stock to provide funds for increasing the plant and equipment about 50 per cent, at a cost of not less than $500,000. The company has been erecting a four-story building across the street from its present plant, and this is now completed and partially equipped. It will probably be in operation within a month. Plans have been completed for a five-story building, to be started within a month, and planned to be completed about Nov. 1. When these additions are all in operation the working force will be increased from about 450, its present number, to 800 men. According to T. G. Meachem, vice-president, more than 60 per cent of the present capacity of the plant for the next five years is contracted for and the total capacity is covered for an entire year ahead.

The Canadian Locomotive Company, Kingston, Ont., has secured an order from the Russian Government for 50 locomotives, which will keep the works employed for about three months. Aemilius Jarvis, president, recently returned from Russia.

PERSONAL

S. S. Brill, who made an extended trip of investigation through South America as agent of the Department of Commerce, giving particular attention to the hardware trade, has prepared an exhibit of samples of European products and catalogs, and this has just been opened at the branch office of the Bureau of Foreign and Domestic Commerce, 409 Custom House Building, New York. Mr. Brill will be in attendance at this exhibit throughout this week. His report on his South American investigations, which contains a large amount of descriptive matter, together with 525 illustrations, has just been submitted to the Bureau of Foreign and Domestic Commerce.

Judge Elbert H. Gary, chairman United States Steel Corporation, started Wednesday, June 30, for the Panama-Pacific Exposition and other points of interest in the West, expecting to return to New York City some time in September. It will be the first time in many years that he has not spent his annual vacation abroad.

W. H. Glasgow has been made assistant general superintendent of the H. C. Frick Coke Company, with headquarters at Scottdale, Pa. Clay F. Lynch is general superintendent.

J. Walter Ingham, for 23 years superintendent of the Warren Foundry & Machine Company, Phillipsburg, N. J., and connected with that company for 43 years, has resigned, to take effect July 1.

Lorenzo C. Dilks, general manager of sales of the Eastern Steel Company, has been made president and general manager of Milliken Brothers, Inc., Whitehall Building, New York. Francis Dykes has resigned as vice-president of Milliken Brothers.

Wilson W. Butler, vice-president Canadian Car & Foundry Company, arrived in New York June 26 from Liverpool, bringing the $85,000,000 contract for shrapnel and high explosive shells which the company concluded with Russia some weeks ago. Mr. Butler is quoted in the daily papers as saying that there are a number of plants idle in Canada which could make large quantities of munitions. The greatest need of the Allies, he said, is not shrapnel but high explosive shells which will destroy reinforced concrete and steel trenches.

The Chalmers Motor Company, Detroit, Mich., announces the promotion of C. Snyder to the position of superintendent of manufacturing. He has been connected with the company for six years and associated with Hugh Chalmers for fourteen years. Previous to his going to Detroit Mr. Snyder was efficiency expert for the National Cash Register Company. In his new capacity he will have complete charge of the manufacture of all parts, from the rough stock to the finished car.

F. E. Parks has been appointed manager of the Minnequa works of the Colorado Fuel & Iron Company, succeeding J. B. McKennan, whose appointment as general manager of the company, with headquarters at Pueblo, Col., was recently announced by President Welborn.

Charles D. McElhany, general manager of sales of the Cambria Steel Company, has been elected a vice-president of the company, filling the vacancy caused by the resignation of J. L. Replogle on March 1.

Waddill Catchings, president Central Foundry Company, has become associated with J. P. Morgan & Co. as assistant to E. R. Stettinius, who has charge of that firm's export department. Mr. Catchings still retains the presidency of the Central Foundry Company.

Frank R. Farnham has joined the staff of Walter B. Snow, publicity engineer, Boston. He was previously with the McGraw Publishing Company, in charge of the copy service department.

H. M. Montgomery, chairman of the Chicago Section of the American Society of Mechanical Engineers, has been elected vice-president and director of the Powdered Coal Engineering & Equipment Company, McCormick Building, Chicago. This company is preparing plans for a large demonstration plant and research laboratory in Chicago where working demonstrations of the adaptation of powdered coal as a fuel to all forms of furnace heat production will be carried on under engineering observation.

Charles J. Stilwell, European representative of the Warner & Swasey Company, Cleveland, Ohio, arrived at New York June 24 and left at once for Cleveland. He states that England is becoming very active in the manufacture of shells and projectiles and would be doing more were it not for the lack of machine tools.

Arthur S. Burden has been elected president of the Burden Iron Company, Troy, N. Y. Other officers elected at the annual meeting are as follows: William P. Burden, vice-president; Daniel W. Tallcot, manager; Robert Forrest, secretary and treasurer; William Millhouse, assistant manager, and James D. Keith, manager of horseshoe sales department.

R. E. Davis, superintendent of automobile instruction in the Milwaukee continuation school, has resigned to accept the position of mechanical engineer of the J. I. Case Threshing Machine Company, Racine, Wis., manufacturing automobiles. He is succeeded by Herbert L. Connell, his assistant, who was formerly of Detroit, where he was secretary of the Detroit section of the Society of Automobile Engineers.

E. G. Vail, former general manager of the Fairbanks-Morse Mfg. Company, Beloit, Wis., has been elected president of the Gurney Refrigerator Company, Fond du Lac, Wis.

T. J. Turley, Owensboro, Ky., has been elected secretary and sales manager of the St. Mary's Machine Company, St. Mary's, Ohio.

H. E. Barrett, who left the Henry Vogt Machine Company, Louisville, Ky., two years ago to become business manager of the Louisville Y. M. C. A., has resigned to resume his position with the company. He will probably be connected with the ice machinery sales department.

Walter E. Blount, plow manufacturer, is at the head of the foreign trade committee of the Evansville Business Association, Evansville, Ind. The committee will devise plans to get Evansville products into the markets of South America.

W. H. Hegmann, superintendent of the Braeburn Steel Company, Braeburn, Pa., has tendered his resignation, effective July 15, after which he will be located at Dunkirk, N. Y., with the Atlas Crucible Steel Company.

E. M. Herr, president Westinghouse Air Brake Company, has received the degree of master of arts from Yale College. He is president of the Yale Engineering Society.

Effective June 24, Joseph Cooper was appointed assistant superintendent of the Farrell open-hearth steel works of the Carnegie Steel Company, succeeding Norman S. Powell, who has been appointed superintendent of the North Sharon open-hearth works.

H. B. Schneider has severed his connection with the Bosch Magneto Company as purchasing agent of its Plainfield (N. J.) factory, formerly known as the Rushmore Dynamo Works.

W. S. Greenawalt, assistant superintendent of the open-hearth department of the Pennsylvania Steel Company, has been appointed superintendent of the open-hearth plant of the American Iron & Steel Mfg. Company, Lebanon, Pa.

Rogers-Brown Company Enlarges Directorate

At a meeting of the stockholders of the Rogers-Brown Iron Company, Buffalo, held last week, the number of directors was increased from five to seven, and the following directors were elected: William A. Rogers, Hugh Kennedy, Walter P. Cooke, John D. Larkin, William T. Shepard, Harold T. Clement and Bradley Goodyear. John D. Larkin (president of the Larkin Company) was also elected second vice-president, to fill the vacancy caused by the death of Seymour H. Knox. W. S. Rogers was appointed assistant to the president, and Harold T. Clement assistant treasurer.

STEEL MEETING IN CLEVELAND

American Iron and Steel Institute Dates October 22 and 23

The directors of the American Iron and Steel Institute have decided to hold the fall meeting in Cleveland on Friday and Saturday, Oct. 22 and 23. The program committee, which has general charge of the preparations for this meeting, consists of James A. Farrell, chairman, E. A. S. Clarke, John C. Maben, Charles M. Schwab, John A Topping and Frank S. Witherbee. A Cleveland committee on arrangements will be named later.

The following were elected to membership in the American Iron and Steel Institute at a meeting of the directors held June 25:

Active Members.

Thomas R. Akin, president LaClede Steel Company, St. Louis.

Henry K. Bourne, Oglebay, Norton & Co., Cleveland.

George L. Collord, manager, blast furnace department, Shenango Furnace Company, Sharpsville, Pa.

Robert F. Gross, sales manager, pig iron department, Pennsylvania Steel Company, Philadelphia, Pa.

Henry Hess, president Hess Steel Casting Company, Witherspoon Building, Philadelphia.

Robert W. Hunt, 2200 Insurance Exchange, Chicago, Ill.

Roy A. Lewis, assistant general superintendent, Saucon plant, Bethlehem Steel Company, South Bethlehem, Pa.

John McConnell, general superintendent United Steel Company, Canton, Ohio.

Herman Edward Townsend, superintendent, open-hearth department, Carnegie Steel Company, Clairton, Pa.

Associate Members.

John C. Bergquist, consulting engineer, Glen Head, N. Y.

John L. W. Birkinbine, Parkway Building, Philadelphia.

Arthur Edward Danforth, Oglebay, Norton & Co., Cleveland.

Albert C. Lehman, president Blaw Steel Construction Company, Pittsburgh.

Charles M. Muchnic, vice-president American Locomotive Sales Corporation, New York.

E. C. Patterson, secretary and general manager, Chattanooga Boiler & Tank Company, Chattanooga, Tenn.

James Philip Thomas, general manager, A. J. Haus and Sons, Ltd., Johnston, Pa.

Jay G. Weiss, Hyatt Roller Bearing Company, Harrison, N. J.

Structural Fabricators Protect Themselves

The Bridge Builders and Structural Society, 50 Church Street, New York, has adopted the following statement and resolution on bidding to general contractors for the purpose of protecting themselves:

Whereas, The General Contractor asks steel fabricators to make bids upon the steel work entering into a given building, in order that the lowest bid so secured may be used by him as a factor in making up his bid on the entire work, and

Whereas, After securing the award of the entire contract it is frequently the practice of said General Contractor, instead of in good faith giving the steel work to the company whose bid he has used, to ignore the company making the bid, and use such bid as a basis for further negotiations with other steel fabricators with the object, and frequently the result, of securing still lower prices for the steel construction, and

Whereas, Such practice is a direct violation of not only a moral but usually an express obligation or a promise to give the steel work to the first lowest bidder whose bid he has used in making up the general estimate, and

Whereas, It is after the owner has awarded his contract that the unfair General Contractor declines to let the steel work upon the price he has used in bidding to the owner, but begins to shop around to get still lower prices to increase his own profit, with the result that the steel work may be skimped and scalped to the detriment of the owner, and

Whereas, The preparation of estimates and bids by steel fabricators involves considerable expense, which will be lost to them if their proposals are not treated in good faith, and are simply to be used as targets by unfair contractors and subsequent bidders after general contracts are let; therefore

Be It Resolved, That bids be made to only such General Contractor as will agree to name, before or at the time of submitting his general bid, the party whose figures were the basis of the price used for structural steel work, and

Be It Further Resolved, That on and after July 1, 1915, the members of the Bridge Builders & Structural Society will endeavor to induce, as a matter of simple fairness and justice, all owners and architects to receive prior to or simultaneously with the bids of General Contractors a separate and distinct bid on structural steel requirements where the aggregate is in excess of 250 tons, such bids to be publicly opened, with the understanding that the most favorable bid will be accepted, or recommended for acceptance if the general contract is let.

OBITUARY

GEORGE ORMROD, who has long been prominently connected with manufacturing interests in the Lehigh Valley, died at his home in Allentown, Pa., June 21, aged seventy-six years. He was born in England, came to this country in 1859, and for a number of years was interested in mining anthracite coal. He then associated himself with others and began the manufacture of cast-iron pipe at Emaus, Pa., the undertaking being known as the Donaldson Iron Company, and at the time of his death he was its president. Mr. Ormrod also became identified with the introduction of the manufacture of Portland cement in the Lehigh Valley and was heavily interested in some of the most prominent companies in that branch of trade. His son, John D. Ormrod, is vice-president and superintendent of the Donaldson Iron Company.

ERNEST PORTER, receiver for the New York State Steel Company, Buffalo, and former superintendent of the steel plant of the Carnegie Steel Company at North Sharon, Pa., died at his home in New Wilmington, Pa., June 16, aged forty-two years. He had been ill for several months. He was graduated from Westminster College and was first employed as a chemist at the North Sharon works, rising to become superintendent of the plant. He was also for a time in charge of the open-hearth furnace department of the Tennessee Coal, Iron & Railroad Company, Birmingham, Ala. He leaves his widow and four sons.

CYRUS A. BYERS, manager of the Baltimore Retort & Fire Brick Company, Baltimore, Md., and widely known as a constructor of gas works, died at the Hebrew Hospital, Baltimore, June 22, after a week's illness. He was born in Springfield, Mass., resided in Philadelphia a number of years, and removed to Baltimore about five years ago. He was a member of the Union League and the Manufacturers' Club of Philadelphia. He leaves a son.

Jones Mixer Suit Finally Decided

At Philadelphia last week the protracted patent litigation between the Carnegie Steel Company, complainant, and the Cambria Iron Company, defendant, entered its final stage when Judge McPherson of the Circuit Court of Appeals affirmed the decree of the Western District Court against the Cambria Company, and ordered the latter to pay costs in the appellate court, the costs in the district court to be awarded by that tribunal. The question decided related to the method of accounting for profits earned by the infringement. The decree of the lower court ordered the Cambria Company to pay to the Carnegie Company $586,305.93, with interest from May 1, 1912, to date of payment. The suit grew out of the Jones patent, granted for an improvement in the method of mixing molten pig iron and charged the Cambria Iron Company with infringement. Judge Buffington, then sitting on the Western district bench, sustained the validity of the claim and held that the process infringed.

Further Advances in Tungsten

Advices from England are that, owing to the increasing demand and the continuing shortage of tungsten ore, the price of ferrotungsten in the latter part of May had advanced at Sheffield to $1.34 per pound of contained tungsten, while the powdered metal was $1.46 per pound. It is reported that the price in this country has now reached $2 per pound as against $1.50 to $1.60 a short time ago.

A South Bethlehem, Pa., dispatch says that the Bethlehem Steel Company is employing at its Saucon and Lehigh plants 13,173 men and 1000 additional at the war munitions plant at Redington. The payroll is now about $700,000 a month. With the completion of the new shell loading plant at Redington and the merchant mill at South Bethlehem the working force will be increased by many hundreds.

Machinery Markets and News of the Works

ENLARGE PLANT FACILITIES

Increasing Production to Meet Demand

Some Large War Orders May Never Be Filled Because Deliveries Cannot Be Made —Improvement Is General

If the aggregate of orders for machine tools booked in the past week shows any falling off it is simply because the manufacturers are so saturated with business that they cannot give the desired deliveries and have been obliged to decline orders. Many of them are making but little effort to add to their present commitments for delivery this year. Second-hand machines have sold for prices approximating those of new machines.

An encouraging sign of the times is the increased number of new plants and extensions to old ones which are projected, or under way in various sections of the country. The New Process Gear Corporation, Syracuse, N. Y., will soon start the erection of a five-story addition to its plant. The Packard Motor Car Company, Detroit, is enlarging its plant with an addition to cost $175,000. The Blount Plow Works, Evansville, Ind., will erect a factory building at a cost of $150,000. The Middletown Car Company, Harrisburg, Pa., is spending $500,000 in improvements. The Harrisburg Pipe & Pipe Bending Company, Harrisburg, which has large war contracts for shells, is erecting another building. Charles P. M. Jacks, consulting engineer, 17 Battery Place, New York, representing New York capitalists, has acquired most of the former Roach shipyard at Chester, Pa. It is planned to add buildings and bring the equipment up to date, to give the yard a capacity of about twelve 400-ft. vessels a year.

In the New York territory there is a continuance of inquiries for shell-making machinery, but deliveries are so far off that some of them will never be closed. The demand for cranes in the East is notable. One of the good orders recently closed is for a gantry crane with a 127-ft. span. It was placed with the Cleveland Crane & Engineering Company. The New York trade is encouraged by the general nature of the inquiries now out, as they indicate a betterment in lines heretofore very quiet.

In New England the activity of the brass mills is intense. Manufacturers who at first were reluctant to take war business are now getting overflow orders at most profitable prices. The Hopkins & Allen Arms Company, Norwich, Conn., recently purchased by the Remington interests, has leased the woodworking machinery plant of C. B. Rogers & Co.

The American Steel Foundries is inquiring for shrapnel-making equipment in Chicago. An inquiry for 200 turret lathes for export to England in the next nine months has been received in Cleveland. The export demand in that city for lathes has taken a spurt. New orders are scarcer in Cincinnati, but the makers of metal-working machinery may be glad of the respite.

Conditions in St. Louis have improved slightly because of demand from other territories. Betterment is shown in the Pacific Northwest.

With the development of orders for shells there has been created a need for multiple cutting-off machines. One interest would welcome a machine capable of sawing a 30-ft. bar into about seventy-one 5-in. sections or slugs at one operation. The demand is so enormous that it is difficult to supply the slugs fast enough. Incidentally some of the steel companies are not attempting to make the larger sizes of bars themselves, but are subletting contracts.

The Crocker-Wheeler Electric Company, Ampere, N. J., has taken a contract to make high explosive shells from the Traylor Engineering Company, Allentown, N. J. The electric company has contracted for 4000 tons of steel bars. It already had a war order from the Canadian Car & Foundry Company. The Allentown company has an English contract.

New York

NEW YORK, June 30, 1915.

The number of managers of plants who find it impossible to get deliveries this year of machine tools which would enable them to take war orders is steadily increasing. Machinery prices are steadily advancing, both for new and old equipment, and the situation with regard to the latter is particularly interesting. Never before, perhaps, have such high prices been paid for second-hand tools. A turret lathe which was sold for $1,800 in 1913 was actually resold a few days ago for $2,000. An instance is related where a machine-tool builder located one of his tools which he had sold twenty-one years ago for $1,540. It was on the market, and he figured that with repairs it might be used in his own shop. He offered to give $300 cash, or $400 in trade for the machine, but $600 was demanded by the seller. Two days later when it was decided to pay $600 it was found that the machine already had been sold for $900.

All lines of the machine-tool industry are now busy. Makers of shapers and boring mills who were not at first affected by the war demand now have plenty to do. A local maker of shapers cannot make certain sizes fast enough to meet the demand. Boring mills have been in good demand for gun mounts, and many have been taken by tool builders as well. An unfortunate phase of the situation is that some inquiries from industrial companies have died when the intending buyers learned of the forward delivery which was necessary.

A great deal of attention is being given to high explosive shells, as it is realized that on these the greatest dependence will be placed when the war reaches its climax. They are somewhat easier to make than shrapnel, inasmuch as they have a wall about ¾ in., are bored from a solid piece and the ends are not swaged in.

Through J. P. Morgan & Co. an order was placed here this week for a brass rolling mill to cost about $20,000. It is to be exported to England.

The Columbia Machine Works & Malleable Iron Company, Brooklyn, N. Y., is inquiring for forty turret lathes and fifty engine lathes for shell work, fourteen grinding machines, twenty screw machines for small parts and twelve drawing presses.

The Jersey City Machine Company, Jersey City, N. J., is inquiring for a sufficient number of machines to turn out 300 18-lb. shrapnel per day.

The George B. Shevlin Company, Saratoga Springs, N. Y., is inquiring for ten automatic, or hand screw, machines to operate on a British shrapnel contract.

W. M. Joy, 225 West Thirty-ninth Street, New York, is inquiring for machines for British high explosive shells.

The General Vehicle Company, Long Island City, which has been a liberal buyer of late, is looking for 16-in. brass Fox lathes.

The Morse Engineering Company, 115 Broadway, New York, has placed an order with the Cleveland Crane & Engineering Company, Cleveland, for a large gantry crane to be erected at San Juan, P. R. It will have a span of 127 ft. and a cantilever of ft. in length. It will be used in coaling ships which use the Panama Canal. The crane business is showing a decided improvement. The Newport News Shipbuilding & Dry Dock Company is in the market for a 75-ton machine shop crane. The Pennsylvania Railroad has readvertised for two 100-ton, five-motor cranes, for its Altoona shops, and also is in the market for a 15-ton gantry crane. The Pennsylvania Steel Company is inquiring for two 50-ton cranes. The New York Central Iron Works Company, Hagerstown, Md., has asked bids on a 10-ton motor trolley crane, and there are many other inquiries before the trade.

Many signs of increasing activity are apparent in the Eastern territory. The American Locomotive Company will reopen its Paterson plant and employ at least 1000 men in the construction of locomotives for Russia. The silk industry in Paterson is thriving and several of the manufacturers are contemplating the enlargement of their mills. The McNab & Harlan Mfg. Company of Paterson, is busy and planning to replace some of its old equipment. Among the companies which are inquiring for one or more machines are the Metropolitan Sewing Machine Company, Nyack, N. Y., the Lake Torpedo Company, Bridgeport, Conn., which has an order for five torpedo boats, and the Skinner Shipbuilding & Dry Dock Company, Baltimore, Md.

It is reported that the American Locomotive Company has practically completed the purchase of 20 lots in Schenectady adjourning its present building and that about $300,000 will be spent for new buildings. It is stated in some quarters that the improvements will include an office building.

New York, N. Y., will receive bids until 11 a. m., July 7, for pumping and drainage equipment for the Catskill Aqueduct. Bids will be received by the principal assistant engineer, Board of Water Supply.

The Studebaker Corporation of America, 445 Broadway, New York, has leased a four-story factory now being erected at the Degnon Terminal, Long Island City, N. Y., and will use it as a service plant for its automobile business and as a warehouse for the vehicle department.

Maywood, N. J., has voted $93,500 of sewer bonds. Charles Staas is borough clerk.

William Demuth & Co., 507 Broadway, New York, manufacturers of smokers' articles, will remove about January next to the New Victoria Building, Twenty-seventh Street and Fifth Avenue, in order to provide for its increased business.

The A. H. Lueders Building Construction Company, 850 Fairmount Place, Bronx, N. Y., has received general contract for the erection of a two-story factory, 100 x 125 ft., to be erected at Glendale, L. I., for William Grelich & Sons, 54 Garden Street, Brooklyn, N. Y., at a cost of about $15,000.

The P. S. Van Kirk Company, 55 Fulton Street, Paterson, N. J., has received general contract to erect a one-story brick dyehouse, 50 x 85 ft., for the Eastern District Dye Works, 260 Norman Avenue, Brooklyn, N. Y., at a cost of about $9,000.

The Gould Paper Company, Lyons Falls, N. Y., has started to rebuild its paper mill B, at Kosterville, recently destroyed by fire.

It is reported that the Richardson Scale Company, Athenia, N. J., will erect a one-story building, 60 x 150 ft. Ewyn E. Seelye, 101 Park Avenue, New York, is given as the architect and engineer.

The Globe Malleable Iron & Steel Company, Syracuse, has let contract for erection of small addition to its foundry.

The Troy Auto Car Company, Troy, N. Y., has been incorporated with a capital stock of $25,000 to manufacture automobiles, motors, engines, etc. L. W. & J. E. Schupp, 96 Manning Boulevard, Albany, and G. A. Vanderbilt, 701 Fifth Avenue, Upper Troy, are the incorporators.

The J. B. Carr Chain Company, 25 Smith Avenue, Troy, N. Y., will erect a factory at Watervliet, N. Y., 100 x 300 ft., three stories and basement, to cost $40,000.

The Growers Cold Storage Company, Waterport, N. Y., recently incorporated by G. Ray Fuller, Waterport, and B. J. Wilson, Carlton, N. Y., will erect a 50,000-bbl. cold storage plant.

The Covert Motor Vehicle Company, Lockport, N. Y., has let contract for a three-story and basement addition, 46 x 92 ft., to its factory.

The Syracuse Cold Storage Company, Syracuse, N. Y., has awarded contract to Charles D. Watson, Syracuse, to erect a seven-story and basement warehouse.

The New York Central Railroad Company has let contract for construction of a one-story battery house at Utica, N. Y.

The Jacob Dold Packing Company, Buffalo, is taking bids for a new beef-house, 100 x 100 ft., four stories and basement, to be erected at its packing plant at William Street, Fillmore Avenue and the New York Central Railroad, of reinforced concrete construction, estimated to cost with equipment $200,000.

Oswego, N. Y., has voted $35,000 in bonds to repair the water works. J. F. Flanigan is city engineer.

The Interborough Rapid Transit Company, 165 Broadway, New York, is planning to erect a one-story brick sub-power station, 72 x 100 ft., at 211th Street, near White Plains Road, at an estimated cost of $50,000. George H. Pegram is chief engineer.

The Eclipse Fireproof Sash & Door Company, 273 Russell Street, Brooklyn, N. Y., has established a factory and plans to install the latest type of machinery from time to time. Aaron Cohn is proprietor.

The Mfg. & Sales Company of the Float-Jet Carburetor, Newark, N. J., has been incorporated with a capital stock of $300,000 by Siegfried Leschziner, James M. Reilly and Charles F. Kraemer, 776 Broad Street, Newark.

New England

BOSTON, MASS., June 29, 1915.

The Naugatuck Valley, Connecticut, from Bridgeport through Waterbury and beyond, presents one of the most interesting and important industrial situations. The brass mills are up to the extreme limit of production and are adding to their capacity for producing ingots and converting them into sheets as rapidly as possible. Labor has become an acute problem. The cutting up works, the plants which convert the sheet metal into all sorts of products, are as a whole equally active; but mostly on materials that enter into war munitions, especially fuse plugs for shrapnel. A few manufacturers have kept aloof from this business, preferring to wait for the overflow, as they call it, of orders which cannot be filled by the big people, for truly domestic trade; because they will be filled up with foreign orders.

The report from Norwich, Conn., is that the Hopkins & Allen Arms Company, recently purchased by the Westinghouse interests in connection with its Chicopee and Springfield, Mass., plants, has leased the plant of C. B. Rogers & Co., making wood-working machinery. The new facilities will be used, according to the published statement, in connection with the Westinghouse contract for 1,000,000 rifles from the British Government.

The Blake & Johnson Company, Waterbury, Conn., manufacturer of presses, rolling mills and tool-grinding machines in its machine department, and automatic machine products manufactured from brass and iron wire and rods in its manufacturing department, is rushed to the limit of capacity. The machine department is being enlarged by the reconstruction of what was the blacksmith shop, which will provide a three-story building with 1200 sq. ft. to each floor. This section of the plant is located on Elm Street, directly in the city of Waterbury. Probably another extension will be built this season, consisting of a cranebay 150 ft. long, to provide the most modern facilities for handling the heavy machinery products. The manufacturing department is located in a new building in Waterville. Its machines are rushed to full capacity, but a very small percentage of the product has to do with war business. The company was slow in taking on the large contracts for ammunition, and in consequence experienced a period of comparative dullness; but is now sharing in the overflow of business which is being placed at advantageous prices. The company is also trying the experiment of a night force in its machine shop, where skilled mechanics are required.

The Connecticut Metal Treating Company, Bridgeport, Conn., has established works at 207 Knowlton Street, to do all classes of heat treatment of steel. It has absorbed the business of the Hartford Metal Treating Company, Hartford, Conn. G. L. Hammond is president and treasurer; and William J. Van Sciver, secretary and general manager. Mr. Van Sciver has had a large experience in this work with several large manufacturers.

The Crompton & Knowles Iron Works, Worcester, Mass., are refitting the Star foundry, one of their properties, and will operate it for the manufacture of gray-iron castings.

The Magnesium Mfg. Company, Rumford, Me., manufacturer of furnace supplies, will occupy a factory, of brick and steel, to be completed at the earliest possible moment.

The Baird Machine Company, Bridgeport, Conn., has purchased the machinery business and good will of the Warner Brothers Company, Bridgeport.

The Smith-Worthington Company, Hartford, Conn., has a large contract for saddles and harnesses for shipment to Europe.

Mansfield, Mass., has voted $30,000 to complete its water system.

Baltimore

BALTIMORE, MD., June 28, 1915.

The National Credit Register Company, recently incorporated, will establish a three-story factory, 60 x 150 ft., near Baltimore, for the manufacture of machines for filing credit slips. Frank T. Forbes, Paterson, N. J., will be president. The company has purchased all the patent rights, machinery and other equipment of the Molenaar Automatic Bill File Company, Paterson. The announcement has been made by the Corporation Fiduciary Company, Munsey Building, Baltimore.

The Maryland Cold Storage Company, 17 East Pratt Street, Baltimore, will soon let a contract for a six-story cold storage plant to cost about $175,000.

To provide increased manufacturing facilities the Baltimore Enamel & Novelty Company, Woodall and Clement Streets, Baltimore, plans the construction of a one-story factory, 128 x 300 ft. The G. E. Painter Company, 324 North Charles Street, Baltimore, is preparing the plans.

Roger Jannus has moved his aeroplane factory from Baltimore to Toledo, Ohio.

Richard J. Leupold, 707 Equitable Building, Baltimore, is seeking details and prices on second-hand steam cranes, pneumatic and steam hammers, lathes and six 250-ton forging presses, all for export.

In addition to a 20,000,000-gal. centrifugal pump, the engineer of the water board, Baltimore, will require three 250-kw. transformers, an 800-hp. motor and a 25-hp. motor for the waterworks.

The Du Pont de Nemours Powder Company, Wilmington, Del., plans to rebuild and put its plant on Brandywine Creek, near Wilmington, into operation.

Matthew Brothers, Norfolk, Va., will rebuild their paint plant recently destroyed by fire with a loss of $25,000.

Philadelphia

PHILADELPHIA, PA., June 28, 1915.

John G. Brown, Witherspoon Building, Philadelphia, Pa., has been awarded contract for the construction of a mining, pumping, screening, washing and drying plant for the Norcross & Edmunds Sand Company, Philadelphia.

Plans drawn by Howard J. Webster, engineer, Harrison Building, Philadelphia, for the Pennsylvania Silk Dyeing & Finishing Company, are reported to call for two 250-hp. boilers to cost about $8,000.

Plans being drawn for the Ashman Forge Works, Tioga and Tulip Streets, Philadelphia, by Howard J. Webster, Harrison Building, Philadelphia, include one 250-hp. boiler.

The American Die & Tool Company, Reading, Pa., has acquired the former S.G.V. plant, where it will manufacture automobile axles and miscellaneous spur gear work. Its main plant has recently been enlarged by the addition of a hardening plant and warehouse.

The Carpenter Steel Company, Reading, Pa., has awarded contract to L. H. Focht & Sons for the reconstruction of its annealing building.

The Hanover Wire Cloth Company, Hanover, Pa., has started work on an addition to its wire cloth factory. Additional equipment has been purchased.

Edwin A. Moore, Robeson Street below Weiser, Reading, Pa., has taken over the foundry formerly operated by William H. Mohn and will operate it for the manufacture of gray-iron castings.

The Middletown Car Company, Harrisburg, is spending $500,000 in improvements and additions to its plant, already partly completed. Work on the remainder is being rushed.

The Harrisburg Pipe & Pipe Bending Company, Harrisburg, has commenced construction of a new machine shop, 60 x 120 ft., and a building for electrical equipment, both to cost about $19,000. A large hydraulic gas cylinder press will be installed. When the extensions are completed about 300 additional men will be employed. The company has just completed a contract for 32,000 shrapnel shells for the United States Government.

Samuel B. Rambo, superintendent of public grounds and buildings for the State of Pennsylvania, will open bids July 15 for the construction and equipment of an arsenal at Harrisburg, for which $40,000 has been appropriated.

The Pennsylvania Steel Company will build a new standpipe to supply water to its Steelton plant. It will be filled by a centrifugal pump of 1,000,000 gal. per hr. capacity.

Samuel A. Morton and Robert C. Morton of the recently organized Morton Truck & Tractor Company, Harrisburg, have returned from London with orders from the Russian and British Governments for 100 four-wheel-drive tractors, seventy-five armored cars, thirty-five 5-ton trucks and 100 5-ton tractors. The contract is said to be worth $5,000,000. Inasmuch as the Morton plant is not yet in a position to turn out such a large order, arrangements are being made with plants in Philadelphia, York and Detroit to furnish parts of the order.

The Ferracute Machine Company, Bridgeton, N. J., manufacturer of presses and sheet metal tools, which has recently increased its machine shop 50 per cent., is again enlarging its main machine shop building 50 per cent. It has purchased the necessary additional crane equipment, and is not now in the market.

Peukert & Wunder, 310 Chestnut Street, Philadelphia, have drawn plans for a two-story reinforced concrete factory, 64 x 130 ft., and power house, for Julius A. Gegbauer, Kensington and Frankfort Avenues.

It is reported that the Aetna Explosives Company, 2 Rector Street, New York, is rapidly erecting a powder mill near Mount Union, Pa.

Stacey G. Glauser & Son, Chester, Pa., have taken over a part of the old Roach shipyard at Chester. It is said the property will be used as a storage place at present but later will be utilized in an industrial way.

Two more buildings are to be added to the plant of the Benzol Products Company, Marcus Hook, Pa. Work on six buildings for the company is being rushed.

The General Chemical Company, Marcus Hook, Pa., is adding two buildings to its plant. The works are being gradually removed from Camden, N. J., to Marcus Hook.

The Viscose Company, Marcus Hook, Pa., plans to double its output.

Chicago

CHICAGO, ILL., June 28, 1915.

The American Steel Foundries, Chicago, has inquiries out for equipment for making shrapnel.

The Bottum Valve Company, Chicago, has been incorporated with a capital stock of $20,000 by George L. Bottum, 162 North Dearborn Street; Louis Hildebrand and George A. Bottum.

The Western Plumbing & Supply Company, Chicago, has had plans prepared for a three-story warehouse, 125 x 125 ft., to cost $40,000.

The American Car & Foundry Company, Wood Street, Chicago, has taken out a permit providing for the construction of a one-story addition to its shops, 66 x 205 ft., to cost $20,000.

C. K. Eckstrom, architect, Chicago, has completed plans for a five-story factory, 100 x 126 ft., to be erected at 2300 Canal Street for F. Sidlo at a cost of $30,000.

The Oppenheimer Casing Company, 76 West Monroe Street, Chicago, will build a two-story brick factory, 57 x 170 ft., at 916 West Thirty-sixth Street, at a cost of $35,000.

The C. F. Massey Company, Kedzie Avenue and West Thirtieth Street, Chicago, manufacturer of railway supplies, has acquired a site for a plant at Clearing. Work is beginning at once on the construction of a brick and concrete factory.

The Ketler-Elliott Erection Company, Chicago, has bought property on California Avenue near Thirty-first Street, on which it will erect a warehouse for the repair and housing of its operating equipment.

The Octigan Drop Forge Company, Twenty-fourth Street and Lowe Avenue, Chicago, will be in the market soon for power and steam hammers. It is now running overtime and plans for an addition to its shop are under way.

The Charn Vacuum Cleaner Company, 711 Fulton Street, Chicago, will equip a manufacturing plant at Harvard, Ill.

The warden of the Iowa State Penitentiary, Fort Madison, is considering the installation of a machine shop for the manufacture of automobile trucks. The State contract for the manufacture of chairs expires this year.

C. C. Norgaard, Council Bluffs, Iowa, has been awarded the general contract for a technical school to cost $80,000, including a machine shop and forge room for the Board of Education, Missouri Valley, Iowa.

Thief River Falls, Minn., will receive bids until 8 p. m. July 6 for a waterworks system. E. J. Overland is city clerk.

Fire destroyed the foundry of the Thief River Iron Works, Thief River Falls, Minn. It will be immediately rebuilt.

The Baldwin Mfg. Company, Nickerson, Kan., organized to manufacture a standing grain harvesting machine, has been granted a charter by the state board. The company is incorporated with $275,000 capitalization.

Milwaukee

MILWAKUEE, WIS., June 28, 1915.

A close survey of the Milwaukee machine-tool trade shows that actual purchases on foreign account have decreased, while domestic buying has gained slightly. Production has not decreased to an appreciable extent, however, and practically all tool builders are busy and expect to maintain their present rate of production well through the summer. The failure of a large crucible and open-hearth steel founder has not shaken confidence, as the proceedings were anticipated and are believed to be a friendly matter. Structural shops are complaining at the lack of improvement in business, the only demand being for small bridges and buildings. The manufacture of war munitions is keeping several large shops busy. Collections are reported to be showing improvement, although it is difficult to induce banks to provide working capital, except upon the very best security.

The North End Foundry Company, West Allis, Wis., has had plans prepared for an addition to its foundry, of brick, steel and wood construction, one story, 60 x 80 ft.

Kenosha, Wis., will install a filtration plant with a capacity of 8,000,000 gal. a day.

The plant of the Wisconsin Fixture Company, Milwaukee, Wis., recently burned, will be rebuilt.

Shawano, Wis., is planning the erection of a power-house for the city water and electric light plant. The Power Engineering Company, Minneapolis, is the engineer.

The J. I. Case Threshing Machine Company, Racine, Wis., will build a branch house at Madison, 100 x 140 ft., to contain a complete service shop and garage.

The Four Wheel Drive Auto Company, Clintonville, Wis., is erecting an addition 100 x 185 ft., to its main shop, to be used for assembling. Additional machine shop facilities are being provided from time to time. The present output of 75 trucks per month will be increased to 125 when the addition is completed.

The Western Iron Stores Company, Milwaukee, one of the largest wholesale and retail dealers in mechanics' tools, machinists', mill and factory supplies, has moved from 135 Second Street to new and larger quarters at 145-147 West Water Street.

The Standard Garage & Machine Company, New London, Wis., has brought out a new type of saw-jointing machine and intends to undertake the production of the machine for the wood-working trade.

The Richards Machine Company, Milwaukee, maker of drill presses and special machinery, has purchased the shop buildings at 3417-3419 Vliet Street, which it has occupied for several years, and will enlarge the works to increase its output. Charles J. Richards is president.

The E. C. Tecktonius Mfg. Company, Racine, Wis., manufacturing hardware specialties, will erect a factory addition, 40 x 108 ft., one story, of brick and steel, to cost $7500. D. R. Davis, Racine, is supervising architect.

The Graper & Paulus Welding Company, Milwaukee, a partnership between Frank E. Graper and Wenzel Paulus, has been dissolved and the business discontinued.

N. C. Miller & Son, Dodgeville, Wis., are planning to engage in the manufacture of a new type of four-wheel drive for automobiles and motor trucks.

The Wisconsin Auto Top Company, Racine, Wis., has changed from a partnership to a corporation, capitalized at $15,000. The corporators are Alice M., Charles V. and Edward P. McAvoy.

The Portage Electric Light & Power Company, Portage, Wis., has purchased for $40,000 the plant and equipment of the Portage sub-station of the Southern Wisconsin Power Company, Madison, Wis., which operates a hydroelectric plant on the Wisconsin River at Kilbourn, Wis.

Indianapolis

INDIANAPOLIS, IND., June 28, 1915.

Howard Cole & Co., who have taken over the Ford & Donnelly foundry at Kokomo, Ind., are planning to remodel it and build a new one for the manufacture of heavy castings. They will also add a power plant and make other improvements, to cost about $75,000.

The Blount Plow Works, Evansville, Ind., will erect a factory building to cost $150,000.

The Logansport Heating Company, Logansport, Ind., has decided to install new equipment at its plant which will practically double its capacity.

The Special Machinery & Foundry Company, Martinsville, Ind., has awarded to S. A. Hickman the contract for building its new foundry.

The Grain Machinery Company, North Vernon, Ind., plans to have most of its work manufactured by contract for some time to come. D. H. Tripp is in charge.

The K & K Novelty Company, Indianapolis, has been incorporated with $30,000 capital stock to manufacture novelties. The directors are O. A. and H. C. Kimber and W. J. Kane.

The Parsons Metal Products Company, Indianapolis, has been incorporated by W. O. Parsons, G. C. Holtman and H. E. Parsons, with $25,000 capital stock to manufacture journal-jacks and other metal products.

The Rice Mfg. Company, Indianapolis, has been incorporated with $15,000 capital stock to manufacture tools, machinery and dies. The directors are A. J. Middleton, A. G. Rice and W. E. Hockett.

The Shields Company, Indianapolis, has been incorporated with $25,000 capital stock to manufacture stoves and appliances. The directors are Frank B. and James M. Shields and James N. Berryhill.

The Bedford Harrow Drag Company, Bedford, Ind., has been dissolved.

The Morgan City Light & Power Company, Martinsville, has been incorporated with $45,000 capital stock by J. H. Stewart, J. J. Albion and L. Lowenberg.

The Gary Motor Truck Company, Gary, Ind., has been incorporated with $25,000 capital stock to manufacture motor trucks. The directors are W. H. O'Donnell, W. C. Phillips and W. J. O'Donnell.

The Wakarusa Water Company, Wakarusa, Ind., has been incorporated with $20,000 capital stock to supply water to the municipality. The directors are J. B. Leonard, A. C. Culp and V. H. Schalliol.

The Southern Chemical Company, Huntingburg, Ind., has been incorporated with $3000 capital stock to manufacture fire extinguishers.

The plant of the Caswell-Runyan Cedar Chest Company, Huntington, Ind., is being enlarged so as to give it 17,000 additional feet of floor space.

The Pioneer Mfg. Company, Middlebury, Ind., has been incorporated with $25,000 capital stock to manufacture tanks and other articles of sheet metal, iron and wood. The directors are C. E. Kauffman, B. E. Wise and C. M. Kauffman.

The Richmond Adding & Listing Machine Company, Richmond, Ind., has been incorporated with $750,000 capital stock to take over the Sweet Adding-Listing Machine Company. The directors are Fred D. Bethard, Curtis M. Wann, W. J. Bethard, Fletcher Johnson and Wilfred Jessup.

The Oliver Chilled Plow Works, South Bend, has taken on additional men and its force is now 3000, about up to normal.

The Fort Wayne Electric Works, Fort Wayne, Ind., will add another building to its plant, 100 x 250 ft., four stories and basement.

The Bank Furniture Company, Indianapolis, has increased its capital stock from $10,000 to $25,000.

The Duplex Hot Air System Company, South Bend, Ind., has been incorporated with $25,000 capital stock. The directors are Floyd A. Deahl, Joseph Wildermuth and Harvey A. Carter.

Detroit

DETROIT, MICH., June 28, 1915.

The demand for machine tools continues fairly active, and in some lines an improvement is noted. Inquiries are good and indicate that next month will show little falling off in business. The demand for second-hand machinery is quite strong. Conditions in almost all lines of the metal trades are satisfactory. War orders are partially responsible for the increased activity; but domestic business also is considerably better than it was during the winter and early spring. Foundries are well engaged. While not up to normal, the volume of construction work is noticeably increasing.

Announcement is made that the Mutual Electric & Machine Company, Wheeling, W. Va., will establish a plant in Detroit. The company, which manufactures a line of switchboards and other electrical supplies, has acquired a four-story factory containing approximately 30,000 sq. ft. at Fort Street and Fourth Avenue. H. J. L. Frank will be general manager of the local plant.

The Wadsworth Mfg. Company, Detroit, which was recently incorporated by Frederick E. Wadsworth and others to manufacture automobile bodies, has taken out a building permit covering the erection of a one-story brick factory, 192 x 336 ft., to cost $30,000.

The Towars Wayne County Creamery, Detroit, has acquired a site on which it is proposed to erect a three-story building, 50 x 105 ft., which will be equipped for the manufacture of ice cream.

The Central Foundry Specialty Company, Detroit, has increased its capital stock from $25,000 to $50,000 and changed its name to the Central Specialty Company.

The Packard Motor Car Company, Detroit, is enlarging its plant by the erection of a five-story addition, 60 x 395 ft., to cost approximately $175,000.

The Jefferson Aluminum Works, Detroit, has been incorporated with $2500 capital stock to manufacture aluminum ware. The incorporators are F. A. Cann, C. C. Terry and F. R. Petz.

The Rands Mfg. Company, Detroit, manufacturer of automobile accessories, is increasing its facilities by the erection of an additional two-story factory, 65 x 153 ft., to cost $20,000.

The N. E. S. Mfg. Company, Detroit, has been incorporated with $30,000 capital stock to manufacture machines for making metal buttons. N. E. and C. A. Sherwood and Leonard E. Brown are the incorporators.

The Wisconsin Bridge & Iron Company, Milwaukee, Wis., has taken out a building permit covering the erection of a one-story foundry, 85 x 270 ft. The cost of the new building will be about $25,000 and it will be occupied by the Atlas Foundry Company, 224 Military Avenue, Detroit.

The Consolidated Car Company, Detroit, automobile manufacturer, has increased its capital stock from $100,000 to $200,000.

The Towler Engineering Company, Detroit, has been incorporated by Max J. L. Towler and others to fabricate structural steel and other steel products. It has taken over the idle plant of the Detroit Bridge & Steel Company and will place it in operation at once.

The Ypsilanti Reed Furniture Company, Ionia, Mich., will enlarge its plant by the erection of a five-story brick addition, 110 x 165 ft.

The Duplex Power-Car Company, Charlotte, Mich., manufacturer of automobile trucks, has increased its capital stock from $100,000 to $200,000 to provide for an increase in its manufacturing facilities.

The Thornapple Gas & Electric Company, Hastings, Mich., has been granted permission by the Michigan Railroad Commission to increase its capital stock from $100,000 to $500,000.

Ray M. Goodsell and Clarence Robinson, Grand Rapids, Mich., have formed a partnership under the style of the Grand Rapids Plating Works and will open a shop at 416 Sweet Street, Northeast.

The Nool Machine Company, Lansing, Mich., will build an addition to its factory, one and two stories, 60 x 200 ft.

The Atlas Drop Forging Company, Lansing, Mich., is planning the construction of a factory.

The Ford Motor Company, Detroit, Mich., has completed plans for its previously announced doubling of the capacity of its assembling plant at Kansas City, Mo., at a cost of about $500,000, and is in the market for the necessary equipment.

Erie

ERIE, PA., June 29, 1915.

The business situation in this city shows an improvement, but this so far has not extended to the engine and boiler makers, except in a limited degree. Most of the engine and boiler plants are at present running light. Inquiries have improved, however, but makers complain that low prices are prevailing. Manufacturers in other metal-working lines are fairly busy. The demand for malleable castings has improved. Forgings are in good demand, especially from the machinery builders. The demand for steam hammers is heavy, considerable business coming at present from railroads and car builders. Makers of white metal castings have all the work they can do.

The Ball Engine Company, Erie, has just completed the building of an erecting shop to be used in connection with its new steam shovel department. The building is a modern brick and steel structure, 150 x 203 ft. It is equipped with a twenty-ton and two five-ton cranes, furnished by Pawling & Harnischfeger, Milwaukee, Wis. The company reports a good volume of steam shovel orders.

The Rickert-Shafer Company, Erie, has recently added to its equipment, increasing its facilities for making its line of tapping machines so that it is in position to make more prompt deliveries. The company is also bringing out several other small tools.

The National Forge & Tool Company, Erie, recently incorporated with a capital stock of $60,000 has just commenced operations in a new plant at West Eighteenth and Cranberry Streets. The company, which occupies a well-equipped building, 50 x 100 ft., will manufacture a line of tool holders and planers bolts, formerly made by the G. R. Lang Company, Meadville, Pa., and a core drill, formerly made by the Triangular Tool Company, Erie. Among its other products on which it will specialize are hollow-bored forgings for machine-tool spindles and other purposes. The company has completed its organization by the election of C. E. Wilder, president; A. J. Gillespie, vice-president, and T. J. McCoy, secretary and treasurer.

The Modern Tool Company, Erie, maker of grinding machinery, is operating its plant night and day and reports such an improvement in the domestic demand for its machines that it does not find it necessary to pay as much attention to foreign business as it has been doing.

The Williams Tool Company, Erie, is well filled with orders for cutting-off and pipe-threading machinery. The manufacture of shrapnel shells has greatly stimulated the demand for cutting-off machines, and this company recently received orders for fourteen machines for export in one day, twelve of these being 4½-in. machines for export to England, and the other two being for shipment to the West Indies. The company is getting a good volume of foreign business from Canada.

The Sims Company, Erie, has just taken an order for 1000 small water-tube boilers for use for generating steam in clothes pressing plants.

The Erie Trailer Mfg. Company, Erie, has just established a plant at Twelfth and Liberty Streets for the manufacture of trailers to be attached to automobiles. These will be made in different capacities for various hauling purposes. In addition a line will be made for attachment to jitney buses for carrying passengers.

Cleveland

CLEVELAND, OHIO, June 28, 1915.

A number of new inquiries for turret lathes in lots of twenty-five to fifty have come out the past week from manufacturers who are figuring on new inquiries for shrapnel shells. The foreign demand for lathes, which has been lighter during the past few weeks, shows quite a spurt. Dealers are getting a good volume of small orders, the heaviest demand being for lathes. The supply of second-hand lathes has been well cleaned out, owing to the inability of buyers to secure new machines for early shipment. Recent sales include quite a few machines from dealers' stocks for shipment to Europe.

The Standard Welding Company, Cleveland, will enlarge its plant by the erection of a one-story brick, steel and concrete building, 100 x 200 ft.

The M. A. C. Tap & Tool Company, Cleveland, has been incorporated with a capital stock of $25,000 by H. J. McGivern, F. T. Cullitan, George Ebert, and others.

The Cleveland Worm & Gear Company, formerly at 990 East Sixty-seventh Street, has leased a three-story factory at Payne Avenue and East Fortieth Street, which will provide much larger quarters than its old plant.

The Cuyahoga Stamping & Machine Company, Cleveland, has been incorporated with a capital stock of $1000 by Paul G. Kassulker, G. N. Shaver, and others.

The Wellman Bronze Company, Cleveland, has increased its capital stock from $50,000 to $100,000.

The W. S. Bidle Company, Cleveland, has commenced the erection of a building, 50 x 100 ft., adjoining its plant, which will be occupied by another company as a machine shop.

It is announced in Canton, Ohio, that the plant of the Novelty Iron Company, maker of steam and hot water boilers and radiators, will be moved from that city to New Castle, Pa., although no official announcement of the change has yet been made. Among those interested in the Federal Radiator Company, New Castle, Pa., recently incorporated with a capital stock of $60,000, are F. H. Mechling, president, and H. K. Downe, secretary of the Novetly Iron Company. It is stated that another company will occupy the Novelty Iron Company's plant in Canton.

The Mybro Heating & Ventilating Company, Canal Dover, Ohio, has increased its capital stock from $1000 to $60,000 and will probably build a new plant for the manufacture of warm air furnaces.

The Bellaire Enamel Company, Bellaire, Ohio, has acquired the plant of the Strong Enamel Company at South Bellaire. It includes four large factory buildings and an office building. It is stated that considerable new equipment will be installed for the manufacture of enameled ware.

The Gramm-Bernstein Company, Lima, Ohio, maker of motor trucks, will enlarge its plant by the erection of a

new building 50 x 200 ft., and will further increase its facilities by the use of another building, 70 x 120 ft., which it has leased from the Lima Brewing Company, and which will be remodeled. New equipment will probably be needed.

The Ohio State Power Company, Fremont, Ohio, which has taken over the plant of the Sandusky River Power Company has placed a contract for a steam power plant with the Wardle-Allen Company of Chicago. It is stated that four 750-hp. boilers and three steam turbines with a capacity of 6000 kw. will be installed.

The American Steel Package Company, Defiance, Ohio, has commenced the erection of a one-story brick addition providing 45,000 sq. ft. of floor space to be used for painting, storage and shipping departments.

The Ohio Motor Truck Company, Ravenna, Ohio, is being organized with a capital stock of $25,000 to manufacture motor trucks. It will succeed the Ravenna Motor Truck Company.

The Steel Grave Vault Company, Orrville, Ohio, is being organized with a capital stock of $200,000 to manufacture steel grave vaults. Charles Boyd, president of the Galion Iron Works, Galion, Ohio, and others, are interested.

The National Pipe Die Machine Company, Archbold, Ohio, which was recently organized to place a pipe-threading machine on the market, has acquired a site on which it will erect a plant, 33 x 60 ft. It has elected the following officers: President, Henry Fagley; vice-president, R. Rodenhuis; secretary, August Ruihley, and treasurer, L. G. Moine.

The city of Conneaut, Ohio, will spend about $12,000 for repairs and equipment for the steam department of the electric light plant, including two new boilers, a new smokestack and three stokers.

The Manufacturers' Equipment Company, Dayton, Ohio, manufacturer of clay-working machinery, is reported to be working on plans for enlarging its plant.

Samuel Austin & Son Company, 14230 Euclid avenue, Cleveland, Ohio, building constructor, has opened a permanent branch office at Bridgeport, Conn., to handle its New England business. It has completed three factory buildings for the Weed Chain Tire Grip Company, Bridgeport, and is now building the new plant for the Bridgeport Projectile Company, and a factory for the Bantam Anti-Friction Company, Bantam, Conn. W. R. Phillips is New England manager.

Cincinnati

CINCINNATI, OHIO, June 28, 1915.

A great many exaggerated reports have been circulated as to the total of orders received for war munitions in this territory. No manufacturer in Cincinnati is engaged in the manufacture of shrapnel; but a company in Norwood, Ohio, is working on a contract that is much smaller than circulated rumors indicate. Excluding harness and saddlery, a conservative estimate of orders for strictly war munitions that have been placed in central and southern Ohio will barely total $22,000,000. Reports that manufacturers of shrapnel are paying fabulous prices for skilled labor are without any foundation.

The machine-tool situation is unchanged. While all plants are busy, new orders and inquiries are scarcer than for some time. Small electrical equipment continues in good demand, with orders reported from all over the country. Building operations, as far as residence work is concerned, are on the mend, but in manufacturing circles the reverse is reported. Makers of metal-working equipment are busy. The stove foundry operators are a little more optimistic as to the outlook. The harness and saddlery manufacturers have lately received additional orders from Europe that will keep them busy for some time.

It is reported, but not confirmed, that the Charles Boldt Glass Company, Cincinnati, will soon purchase a number of tanks to be installed in a building recently completed.

The Baldwin Piano Company, Cincinnati, will make some additions to its dry-kiln plant.

The Wardlaw-Thomas Paper Company, Middletown, Ohio, will reconstruct its warehouse recently destroyed by fire with a loss of about $65,000.

C. C. Wilson, Dayton, Ohio, has acquired a site at Summit and Chapel Streets on which he will erect a plant for the manufacture of gasoline farm tractors. Tentative plans include the erection of two one-story buildings, 60 x 100 ft. Considerable equipment will be required later.

The Butler Cycle & Electric Company, Middletown, Ohio, has been incorporated with $10,000 capital stock by J. A. Pratt and others. A repair shop will be operated by the company.

The Columbus Bolt Works Company, Columbus, Ohio, has been incorporated with $660,000 capital stock, and will take over the plant of the Columbus Bolt Works. J. R. Poste is one of the principal incorporators.

The Corrugated Container Company, Columbus, Ohio, is fitting up its plant and expects to have it in operation at an early date. Practically all equipment has been purchased.

The Athens Electric Company, Athens, Ohio, has increased its capital stock from $10,000 to $75,000 to take care of contemplated additions to its plant.

The Gray & Smith Milling Company, Wooster, Ohio, has been incorporated with $100,000 capital stock by A. G. Smith and others. The plans of the company are not yet known.

The Buckeye Mill & Lumber Company, Jackson, Ohio, will rebuild its plant, recently destroyed by fire.

Lusk, Anglemeyer & Lockwood, Troy, Ohio, have let contract for a foundry building, 56 x 80 ft., one story, of reinforced concrete construction. A specialty will be made of steel, malleable and aluminum castings.

Birmingham

BIRMINGHAM, ALA., June 28, 1915.

The recent improvement in the machinery market has gathered no further impetus except in an increased temporary demand for sawmill equipment, including boilers and engines. Rapid extension of hydroelectric lines has created a continuous and regular demand for electrical equipment at the coal mines. It has become a business of a really extensive character and will develop constantly for the next few years.

The Blount Springs Company, Blount Springs, Ala., will build a plant for the manufacture of slack and tight barrel staves.

The Warrior Timber & Contracting Company, Birmingham, has been incorporated by C. McCormick, W. P. Yeatman and Will MacFarlin, and is installing logging and quarrying equipment.

The Henderson Lumber Company, Northport, Ala., has been incorporated by J. E. Henderson, Enterprise, Ala.; Fox Henderson, Troy, Ala., and others. They own 25,000 acres of timber land and, it is reported, will expend as high as $1,000,000 in building sawmills, etc., with a daily capacity of 250,000 ft.

The O. T. Grimes Cooperage Company's plant near Tuscaloosa, Ala., recently burned, is to be rebuilt.

J. R. Raible & Co., Cleveland, Ohio, have purchased the plant of the Tuscaloosa Cooperage Company, Tuscaloosa, Ala., for $15,000.

T. E. Henderson, L. M. Studstill, and others, Andalusia, Ala., are interested in the establishment of a packing plant to cost $125,000.

The Hartselle Oil & Fertilizer Company, Hartselle, has been incorporated with a capital stock of $25,000 by C. O. Jaggard, S. E. Stewart, and others, and proposes to build a cotton-seed oil mill and fertilizer plant.

E. J. Ostling, E. W. Wright of Tuscaloosa, Ala., and others, will establish a brick plant at a cost of $25,000.

Lathrop & Hatton, Sylacauga, Ala., propose to establish a sawmill on the Coosa River.

J. M. Jones, Chester, S. C., has purchased a site for the construction of a garage and bottling plant.

The Central South

LOUISVILLE, KY., June 28, 1915.

A decidedly improved outlook is reported by manufacturers of machinery. Not only are more inquiries coming in, but orders are fairly numerous and prospects are good. Going concerns are enlarging their plants, making additional equipment necessary, and indicating greater confidence in future developments, while new enterprises are being started in larger number than for some time. The demand for power equipment continues to be the big feature of interest, boilers being in good call. Electrical equipment is also selling better than for some time. Wood-working machinery, ice machines and contractors' equipment are probably the most active of the special lines at present; but machine tools are also coming to the front.

The C. Lee Cook Mfg. Company, Louisville, reports a much better demand for metallic steam packing from the marine trade, but business in other lines is quiet. The company was recently incorporated with $50,000 capital stock. C. Lee Cook is the principal stockholder.

Milton Squires has purchased an interest in the machine shop of James Bishop, Cloverport, Ky., and the business will be conducted as Bishop & Squires.

J. R. Soard, Lexington, Ky., will establish a plant for the manufacture of concrete building blocks and sewer pipe.

Fred Hunt, Somerset, Ky., is in the market for a machine for boring solid wood porch columns.

C. L. Morris, Mary, Ky., is asking for prices on machinery for the manufacture of cotton oil and other cotton seed products.

H. C. Beam & Son, New Haven, Ky., are preparing to equip an automobile garage and repair shop.

S. H. Brixley, Tullahoma, Tenn., is building an automobile garage, and will be in the market shortly for tools for the repair shop.

The Union Tanning Company, Johnson City, Tenn., will build a plant for the manufacture of tanning extracts. The capacity will be 100 bbl. a day. Boilers and special apparatus will be required.

J. C. Parks, Columbia, Tenn., will erect a concrete abbatoir, which will be equipped with refrigerating machinery.

The Southern Saddlery Company, Chattanooga, Tenn., has increased its capital stock from $25,000 to $100,000, and will enlarge its plant, erecting a new building and installing additional equipment. Alfred Scholze is secretary.

The Illinois Central Railroad, with general offices in Chicago, is planning the construction of a roundhouse and larger turntable at Jackson, Tenn. A. S. Baldwin is chief engineer.

Maryville, Tenn., will open bids July 7 on the construction of a complete system of waterworks, including a brick pumping station with equipment, with alternate bids for electrically-driven units. R. C. Huston & Co., Memphis, Tenn., are the engineers.

Dandridge, Tenn., is planning the erection of an electric light plant with the proceeds of a proposed $10,000 bond issue.

Texas

AUSTIN, TEX., June 26, 1915.

The machinery and tool trade generally is very satisfactory. The demand for dredging machinery is unusually heavy.

The Texas Gravel Company, Houston, which has increased its capital stock from $30,000 to $100,000, plans to enlarge its facilities for handling gravel.

The Lexington Mfg. Company, Lexington, has been organized by B. F. Wade, and others.

The T. J. Williams House Mfg. Company, Houston, has been organized with a capital stock of $25,000. T. J. Williams is a stockholder.

The Texas Light & Power Company, Austin, has purchased the electric light plant at Bartlett. Extensive improvements are planned.

The Dallas Fire Face Brick & Tile Company will build a plant at Athens for the manufacture of brick and tile, etc. It will have a daily capacity of about 40,000 brick and eighty tons of tile. J. S. Johnson, Dallas, is president and general manager.

At a recent meeting of the board of directors of the Texas Light & Power Company at Dallas, it was voted to issue $140,000 additional bonds to be used in making extensions and improvements to the company's properties at Sherman, Denison and Waco.

The Arizona Power Company, Prescott, Ariz., will use the proceeds of the $200,000 of bonds, for the construction of a second hydroelectric plant on Fossil Creek. The new plant will be used to supply power for industries in and about Prescott.

The Bangs Union Gin Company, Bangs, will build a cotton gin, to cost $14,000. J. H. Sanderson is in charge.

Steps will soon be taken at Victoria to construct a municipal electric light plant, to cost $40,000.

Marlin has voted $35,000 of bonds for improving the waterworks plant and sewer system.

Edwin Day, Ballinger, will build a cotton gin. An 80-hp. engine will be required.

The Galveston Dry Dock & Construction Company, Galveston, Tex., has been organized and has applied to the city for a water front of 600-ft., as a site for a marine railway and shipbuilding plant. The company guarantees to spend $100,000 within two years and $150,000 within five years, if the lease is granted.

It is authoritatively stated by E. P. Turner, Dallas, and other directors of the Dallas Northwestern Traction Company, that plans are being matured for the early construction of the proposed interurban electric railway between Dallas and Wichita Falls, a distance of more than 100 miles.

The El Paso Ice & Refrigerator Company, El Paso, has prepared plans for a creamery. The machinery will cost about $2500.

St. Louis

ST. LOUIS, MO., June 28, 1915.

While the aggregate of machine tool business has increased slightly, it is regarded by dealers as having been indirectly the result of the pressure of war orders from other centers. The tone remains optimistic. The orders which have been placed have been for single tools of wide variety, indicating no particular industry as in need for equipment more than another. Second-hand tools are in light, but somewhat improved request.

The All Steel Motor Car Company, St. Louis, Mo., has been incorporated with a capital stock of $400,000 by F. U. L. and Fred Smith, Andrew C. Duncan, Oscar A. Trorlicht and Hunter Woodson to manufacture automobiles. The plant will be located at Macon, Mo., where buildings have been acquired. Machinery is to be installed at once.

University City, Mo., voted to install an electric lighting plant.

The Landro Mfg. Company, St. Louis, Mo., has been incorporated with a capital stock of $20,000 by Thomas G. Landers, J. Y. Gould and W. H. Young to manufacture predigesting food equipment for stock feed, etc.

The plant of the Hammond Sheet Metal Company, St. Louis, Mo., was destroyed by fire, causing a loss estimated at $65,000.

The new machinery for the Chillicothe, Mo., waterworks includes one 375-kw. three-phase sixty-cycle 2300-volt generator, direct-connected to engine, one motordriven centrifugal pump of 500-gal. per min. capacity, a condenser, oil separator, etc. Bids will be received until July 15. Harper & Stiles, Kansas City, Mo., are consulting engineers.

Drexel, Mo., has voted funds for the installation of an electric light plant.

The New Hampton Electric Company, New Hampton, Mo., has been incorporated with a capital stock of $14,000 by C. A. Rowland, W. A. Denny and E. C. Morgan.

The Missouri Gas & Electric Service Company, Richmond, Mo., will install a boiler, etc. Otto MacMahon is manager.

An electric light, power and heat plant will be equipped at once by A. A. Tibbe, Washington, Mo., including a double installation of boilers, engines and generators.

The Mathews Construction Company, Midland Building, Kansas City, Mo., has been organized to specialize in the construction of electric light plants. J. A. Jackson is president.

The Ramsey Auto Mfg. Company, Kansas City, Mo., has been incorporated with a capital stock of $14,000 by J. A. and Leo Ramsey, and others, to manufacture special automobile engine parts.

The Emerson Gin Company, Emerson, Ark., has been incorporated with a capital stock of $25,000 by W. D. Wingfield, O. G. Traylor and James E. Yates and will install four seventy-saw gin stands, including gas engines.

The J. C. Shepherd Mining Company, Rush, Ark., will replace its steam plant with crude-oil engines.

J. F. McCuistion, Newport, Ark., will install a machine shop in a garage being erected for him by C. J. Saenger.

The E. T. Peck Cooperage Company, Bentonville, Ark., will equip an addition to its plant for the manufacture of both tight and slack cooperage barrels.

Henry Dusenberry, England, Ark., general contractor, is reported in the market for gasoline or steam hoisting equipment.

A cotton gin and an engine of 125-hp. will be installed at Bristow, Okla., by Joseph Abraham. Similar equipment will also be installed by C. C. Epps of the same place.

The Hobart Cotton Oil Mill Company, Hobart, Okla., has been incorporated with a capital stock of $25,000 by local capital, and will install a five-stand cotton gin.

The Tyrone Light, Ice & Power Company, Tyrone, Okla., will install electric generating equipment, a three-ton ice plant, etc. W. J. Harville is manager.

The Standard Roofing & Material Company, Kansas City, Mo., is in the market for equipment. I. V. Gray is president.

The wax plant planned by the Pierce Oil Corporation to cost about $600,000, will probably be built at Tulsa, Okla. John L. Gray, St. Louis, Mo., is in charge.

John A. Wise and H. E. Bagby, Vinita, Okla., will equip a machine shop for automobile work at a total cost of about $10,000.

The Yazoo Southwestern Railroad Company, Yazoo City, Miss., is reported in the market for repair and machine shop equipment. Walter C. Murphy is president.

The Yarbrough Electric Company, Columbus, Miss., has been incorporated with a capital stock of $11,000 by T. W. Yarbrough, Stanley, and others.

The Finkbine Lumber Company, Wiggins, Miss., will install steam turbine driven equipment of about 250,000 ft. per day capacity. E. C. Finkbine, Des Moines, Iowa, is president. W. E. Guild is local manager.

The Meridian & Memphis Railway Company, Meridian, Miss., will equip terminal and shop buildings. S. A. Neville is in charge.

Monroe, Ala., will expend about $400,000 on its electric light system and waterworks. Walter G. Kirkpatrick, Birmingham, Ala., is the engineer.

The Texas Company, Houston, Tex., and New York City, will install oil-distributing equipment at New Orleans, including pumps, etc., to cost about $150,000.

On June 22 an appropriation of $50,000 will be available for use by the Oklahoma Board of Affairs. It is proposed to use this money for the establishment of a chair and furniture factory at the State Penitentiary, McAlester.

The Mid-Western Film Mfg. Company, Oklahoma City, Okla., has been incorporated with a capital stock of $50,000 by R. L. Smith, L. P. Arnold and G. B. Hale.

Philadelphia, Miss., will expend $30,000, already authorized, for waterworks and a sewage disposal plant.

Malone & Keesler, Clarksdale, Miss., will equip a cotton packery at that point. About $5000 of equipment is wanted. Percy Chamberlain is manager.

The Pacific Coast

SEATTLE, WASH., June 22, 1915.

Conditions in the Pacific Northwest have shown more tangible improvement in the last month than for some time. Business is not normal; but increasing activity is evident in many lines, and machinery houses report orders increasing in number, if not in magnitude. Some notable railroad improvements are in prospect, and the United States Government work in Alaska is already resulting in considerable business on Puget Sound. Highway work also calls for more equipment. Buying for mining interests continues to increase, with some important developments projected. Logging and sawmill machinery remain quiet. The local demand for metal-working machinery shows little improvement, but stocks of some classes of tools have been well cleaned out by requirements of other markets. The Alaska Engineering Commission is still in the market for a large supply of small tools. Several shipments of this nature have been sent north, and others will follow soon.

C. M. Christiansen, logging contractor, Timber, Ore., has taken a contract to remove 17,000,000 ft. of fir from the holdings of John Peterson at Woodlawn, on the Lewis River.

The Northwest Electric & Waterworks Company, Montesano, Wash., has issued $500,000 of bonds, the proceeds to be used in making extensions and improvements to the Montesano water system. A power plant is now being built on the Chehalis River.

Fromberg, Wash., will call for bids for the construction of a water system for which $17,000 of bonds was recently voted. Lynne C. Lum is chairman of the board of aldermen. The construction will include a pumping system, electrically operated.

The mill of Brown & Kunze, Arlington, Wash., recently destroyed by fire, will be rebuilt at once with a capacity of 100,000 ft. per day.

Robert Lytle, Hoquiam, Wash., and associates, plan the establishment of a shingle mill on a site donated by the city. The plant will be operated by electricity produced by the company, and separate motors will be attached to each machine. It will have a 10-hp. capacity of 400,000 shingles.

According to J. M. Beford, Klamath Falls, Ore., forest supervisor of the Klamath Reservation, the United States Government will erect a sawmill at Kirk, to be operated by the Klamath Indians. It will have a capacity of 30,000 to 35,000 ft. per day, and will be erected this year. A shingle and planing mill are also planned.

The Post Lambert Mining Company, Bellingham, Wash., plans the expenditure of $25,000 for machinery and improvements, including sawmill, generator and motor, air compressor, etc.

W. S. Seiling Company, Spokane, has been incorporated to manufacture plumbers' specialties. W. E. Gibson, James McStarvich, H. D. Farris, and others, are the incorporators.

International Mill Company, Sumas, Wash., has been incorporated for $10,000 by Frank L. Nash, E. M. Nash and John Hodges. It will build a small mill.

Bebb & Gould, Seattle, are preparing plans for machine shop for the Pacific American Fisheries Company, Bellingham, Wash.

The Castle Rock Briquet Company, Castle Rock, Wash., has filed articles of incorporation with a capital stock of $150,000. The incorporators are D. J. Hille, C. C. Ruckles, J. B. Wilkes, M. R. Cummings, and others.

The machinery house of Landes & Co., Salt Lake City, Utah, has been reorganized under the name of the Landes-Austin Machinery Company, with a capitalization of $50,000. James B. Austin is a new member of the company. It will specialize on tractors, implements, road machinery and cable tramways.

Los Angeles, Cal., will receive bids until 10 a. m. July 6 for constructing a pumphouse and installing machinery for its sewage disposal plant. H. B. Ferris is secretary of the board of public works.

Parties interested in the California Paper & Board Mills, San Francisco, have organized the Northern Board & Paper Mills, which proposes to build a large boxboard mill at Sumner, Wash. The works at Sumner will be managed by C. H. Meyers.

The Klamath Mfg. Company, Klamath Falls, Ore., is adding a lot of machinery to its box factory, and building a new sawmill of 60,000 ft. daily capacity.

W. T. McClure, city engineer, Sacramento, Cal., will receive bids until July 7 for constructing a powerhouse for the Normal School at Chico.

Canada

TORONTO, ONT., June 26, 1915.

The Alton Foundry Company, Alton, Ont., is in the market for one 75-hp. boiler, one 75-hp. engine, several 20 to 50-hp., three-phase, 60-cycle, 220-volts motors, and a small shaper and milling machine.

The Dominion Bridge Company, Montreal, Que., is about to establish a new plant for the manufacture of high explosives, etc., which will cover an acre of ground.

Slough & Bush, St. Catharines, Ont., will equip a plant for the manufacture of shells.

The Ker & Gordon Company, Brantford, Ont., has been reorganized for the manufacture of shrapnel shells.

The Record Foundry, Moncton, N. B., is installing $40,000 worth of machinery for the manufacture of shells.

The Canadian Brakeshoe Company, Montreal, Que., will install some machinery.

The MacKinnon-Holmes Company, Montreal, Que., will install machinery for the manufacture of shells.

The new plant of the Canadian Cartridge Company, Hamilton, Ont., will be 100 x 300 ft., and will cost $30,000. A new machine shop and boiler room will also be constructed.

The Tudhope Anderson Company, Ltd., Orillia, Ont., is installing machinery for the manufacture of shells at a cost of $35,000.

The boiler plant of T. Hogan & Co., 123 Water Street, Halifax, N. S., was destroyed by fire with a loss of $10,000.

The engine room of the Paul Lea Company, 96 Westmorland Street, Moncton, N. B., was destroyed by fire with a loss of $2000.

G. W. McFarlane, Paris, Ont., will install machinery for the manufacture of shells.

The H. Corby Distillery Company, Ltd., Corbyville, Ont., is in the market for an air compressor either belt or motor driven, of 100 to 200 cu. ft. of air per min. capacity; one brass-lined or brass end motor-driven pump of from 40 to 120 gal. per min. capacity.

John Carew, William Street, Lindsay, Ont., is interested in a company which is contemplating the erection of a chemical works at Fenelon, Ont.

J. Turgeon, 18 Carrier Street, Levis, Que., will erect a sash and door factory to cost $5000.

R. C. Harris, commissioner of works, Toronto, Ont., has recommended the purchase of two electrically-driven pumps for the high level pumping station, with a capacity of 7,500,000 gal. per day.

The Ontario Hydro Electric Commission, Continental Life Building, Toronto, Ont., is in the market for one three-phase, 2300-volt, sixty-cycle alternating current generator of 300 to 375 kw. for belt drive.

Port Hope, Ont., will borrow $35,000 for improvements to the waterworks plant.

An explosion caused $10,000 damage to the Peabody Sales Corporation, Ltd., Walkerville, Ont. J. E. Lennox is general manager.

The Monteith Pulp & Timber Company, Ltd., Toronto, Ont., has been incorporated with a capital stock of $40,000 to manufacture pulp, timber, etc. Edward R. R. Heyland, 123 Bay Street; James H. G. Wallace, Stair Building, and others, all of Toronto, are provisional directors.

A plant to cost $100,000 is to be built at St. Catharines, Ont., by the Lord & Burnham Company, manufacturer of skylight adjusters, Irvington-on-the-Hudson, N. Y.

A plant for the manufacture of knitting machines, etc., is to be erected by the Georgetown Foundry & Machinery Company, Ltd., Georgetown, Ont., recently incorporated by John A. Willoughby and others with a capital stock of $40,000.

The Montreal Ammunition Company, Ltd., Montreal, a subsidiary of the Dominion Bridge Company, has rented the premises of the National Bridge Company and will install machinery for the manufacture of war munitions.

J. W. Cumming's machine plant at New Glasgow, N. S., has been destroyed by fire with a loss of $5000.

The Canadian Billings-Spencer Company, Ltd., Welland, Ont., is erecting an addition to its plant, 70 x 80 ft., at a cost of $30,000. Six new drop hammers are to be installed.

The Board of Control, Montreal, has reported favorably upon an addition to the mechanical filtration plant at an estimated cost of $900,000.

P. Polino, Newmarket, Ont., contemplates erecting a factory for the manufacture of toys.

The W. A. Swayze Company, Ltd., Toronto, has been incorporated with a capital of $40,000 to manufacture automobiles, trucks, etc. Oscar H. King and M. P. Van der Voort, both of 13 Wellington Street, East, Toronto, are provisional directors.

The plant of the Canadian Standard Auto & Traction Company, Ltd., Moose Jaw, Sask., has been taken over by John Robson of the Moose Jaw Commercial Agency.

A company with a capital of $3,000,000 is being formed in Quebec to develop hydroelectric power in that city and at Three Rivers. The promoters are Charles H. Branchard, Outremont, Que.; Howard Murray, Milton L. Hersey and Julian C. Smith, all of Westmount, Que., and Charles McDougall, Montreal.

A new elevator with a capacity of 65,000 bu. is to be erected at MacLeod, Alta.

The Invincible Machine Company, Ltd., Toronto, has been incorporated with a capital stock of $100,000 to carry on business as machinists, toolmakers and manufacturers of ammunition. James Y. Murdoch, 41 Keele Street, and E. Brooke Daykin, St. Leonard's Avenue, Toronto, are provisional directors.

The branch plant of the American Toledo Scale Company, Windsor, Ont., is to resume operations as a result of large orders recently received.

The Universal Stove & Furnace Company, Ltd., has been incorporated to take over the Wizard Furnace Company, Ltd., manufacturer of stoves and furnaces, Toronto. The capital stock is $500,000 and the incorporators are George M. Kelley, General Trust Building, Toronto, and John D. Falconbridge, 22 Chestnut Park Road, Toronto.

The Vacuum Street Cleaning Machine Company, Ltd., Windsor, Ont., has been formed to manufacture street-cleaning and air-cleaning and drying apparatus. The capital stock is $175,000 and the incorporators are George S. Clarke and John A. Corrick, both of Detroit, Mich.; William L. Jenks and Albert D. Bennett, both of Port Huron, Mich., and William T. Blaney, Windsor, Ont.

The National Elevator Company, Port Arthur, Ont., is rebuilding its elevator there, which was destroyed by fire May 3 with a loss of $50,000. It will have a capacity of 65,000 bu.

The Western Terminal Elevator Company is about to build a mixing elevator at Fort William, Ont., to cost $100,000.

Hogg & Lytle, Royal Bank Building, Toronto, Ont., will shortly construct a grain elevator of 30,000 bu. capacity at Manor, Sask.

Ingersoll, Ont., will spend $10,000 for extensions to its waterworks plant. W. R. Smith is clerk.

The Cutler Shingle Company, Ltd., is the name of a new company formed at Port Coquitlam, B. C., with a capital of $20,000 to take on the business formerly carried on by W. B. Cutler.

The ratepayers of Lindsay, Ont., passed a by-law to guarantee the bonds of Horn Brothers to the extent of $65,000. The Horn Bros. Woollen Company will rebuild its plant which was destroyed by fire last December and will install in the new building $40,000 worth of the latest type of machinery.

Messrs. Olsen and Johnson will erect a 50-barrel flour mill at Morrin, Alberta.

Government Purchases

WASHINGTON, D. C., June 29, 1915.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until July 13, schedule 8501, for two auxiliary condensers, two double-tube boiler injectors, two single acting air pumps, four vertical simplex feed pumps and four duplex horizontal fuel oil pumps, all for Norfolk; until July 27, schedule 8508, two steam turbine-driven blowers, for Mare Island; until August 3, schedule 8516, four water-tube boilers for Mare Island; until August 10, schedule 8539, one refrigerating plant; schedule 8540, one condenser pump, fifteen feed water, fire and bilge pumps; all for Mare Island, or f.o.b. works; schedule 8541, for furnishing and installing one sand blast outfit for Puget Sound.

Bids were received by the Bureau of Supplies and Accounts, Navy Department, Washington, June 22, for supplies for the navy yards, as follows:

Schedule 8343, Steam Engineering

Class 11, Puget Sound—Eleven valve reseating machines—Bid 111, $2,045, informal; 137, $1,595; 159, $1,595; 181, $1,595; 185, $1,595; 188, informal; 203, $1,595; 210, $1,595; 211, $1,595; 250, $1,595; 266, $1,595; 291, $1,595; 302, $1,595; 303, $1,595; 386, $1,595.

Schedule 8402, Ordnance

Class 121, Newport—Four automatic screw machines—Bid 64, $1,730; 231, $5,230.

Schedule 8407, Steam Engineering

Class 141, Brooklyn—Sixteen engine lathes—Bid 129, $5,776.80; 140, $5,510; 160, $5,525; 181, $2,912, part, four machines, 203, $5,990 and $6,600; 233, $6,472, $6,712, and $6,772; 239, $7,250.

Class 142, Brooklyn—Two automatic screw machines—Bid 64, $1,247.50.

Class 143, Brooklyn—One plain grinding machine—Bid 64, $1,745; 126, $1,525; 181, $1,675; 203, $1,525.

Class 144, Brooklyn—One rotary splitting shear—Bid 317, $1,488.

Class 145, Brooklyn—One pattern-maker's grinder—Bid 31, $664; 131, $598.50; 203, $600; 233, $695; 245, $520; 263, $677.

Schedule 8408, Construction and Repair

Class 151, Mare Island—One rivet heading machine—Bid 1, $2,947 and $3,197; 4, $3,454; 203, $3,300; 233, $2,969 and $8,089.80.

Schedule 8410, Construction and Repair

Class 171—One universal forging machine—Bid 4, $5,369; 203, $5,868.

Schedule 8452, Construction and Repair

Class 344, Charleston—One automatic cut-off saw—Bid 118, $912.50; 136, $1,058; 203, $1,035.

Class 345, Charleston—One bending press—Bid 308, $1,175.

The names of the bidders and the numbers under which they are designed in the above list are as follows::

Bid 1, Acme Machinery Company; 4, Ajax Mfg. Company; 31, Charles H. Besly & Co.; 64, Brown & Sharpe Mfg. Company; 111, Eccles & Smith Company; 126, Walter H. Foster Company; 129, E. L. Fraser; 131, Gardner Machine Company; 136, Greenlee Brothers & Co.; 137, Richard W. Geldart; 140, Garvin Machine Company; 159, Hallicie Machinery Company; 160, Hendey Machine Company; 181, Kemp Machinery Company; 185, Knickerbocker Supply Company; 188, Leavitt Machine Company; 203, Manning Maxwell & Moore, Inc.; 210, Montgomery & Co., Inc.; 211, Manhattan Supply Company; 231, National-Acme Mfg. Company; 233, D. Nast Machinery Company; 239, Niles-Bement-Pond Company; 245, Oliver Machinery Company; 250, Pacific Tool & Supply Company; 263, Prentiss Tool & Supply Company; 266, Perins Machinery Company; 291, Sherritt & Stoer Company, 302, Steam Supply & Rubber Company; 303, Richard B. Sherman; 317, Scully Steel & Iron Company; 319, Swind Machinery Company; 372, R. D. Wood & Co.; 386, James D. Rawles Company.

The Davies & Thomas Company, Catasauqua, Pa., has appointed George Davies general agent of the company, in charge of the New York office, which will be located in the Equitable Building, 120 Broadway. The company has operated for many years a jobbing foundry and machine shop and beginning with 1889 has executed a number of contracts for cast-iron tunnel segments in the Metropolitan district. Probably 175,000 tons of its segments are now in place in the tunnels under the North, East and Harlem rivers.

Trade Publications

Automatic Band Saw Guide.—Automatic Saw Guide & Machine Company, Irwin, Pa., Booklet No. 2. Describes a band saw guide, the use of which is claimed to decrease the breakage of saw blades and the friction and wear on both the saw blade and the guide while safety in operation, variety of work handled, accuracy of the work and the amount produced are increased. The guide is not rigid but has a lateral swinging movement which allows the saw to swing freely at the back but holds the teeth practically stationary. A diagram showing the principle of the operation of the guide is presented, together with view of it in use. A partial list of users, which includes iron and steel and planing mills, automobile factories, pattern and machine shops and general manufacturing plants, is given.

Steam and Power Pumping Machinery.—Union Steam Pump Company, Battle Creek, Mich. Collection of bulletins. Treat of an extensive line of steam and power pumping machinery that is built in a number of different types. The particular advantages of the simplex pump as compared with the duplex are touched upon and following this the various pumps are described and illustrated, condensed specification tables and engravings and drawings of the several parts being included in a number of cases. Instructions on the installation and operation of the pumps are given.

Twist Drills and Reamers.—Whitman & Barnes Mfg. Company, Akron, Ohio. Folder. Gives illustrations of some of the work done by the twist drills and reamers of this company. These occupy the first three pages of the folder while the last contains illustrations of a few of the types of carbon and high-speed twist drills and reamers produced as well as some screw and drop forged wrenches. In one of the operations illustrated, almost 50,000 holes were drilled and of these all but approximately 6100 were 15/16 in. in diameter, the majority being drilled through two, three and, in some cases, four thicknesses of metal. In addition some 4000 holes 13/16 in. in diameter were increased to 15/16 in.

Iron Ore Sample Grinding Machines.—Braun Corporation, Los Angeles, Cal. Folder. Concerned with a machine that has been built especially for grinding iron ore samples and other very hard material. Special emphasis is laid upon the rapidity with which the material that may be any size up to a maximum of ¼ in. is reduced to any desired degree of fineness up to 200 mesh. An illustrated list of parts is included.

Drafting Machines.—Universal Drafting Machine Company, Cleveland, Ohio. Pamphlet. Describes a drafting machine consisting of two parallelograms, a protractor and a square having graduated ruling edges. After a general description of the construction of the machine the different arrangements that can be furnished are illustrated as well as several types of protractors, anchors and scales that can be supplied. A number of engravings of the machine in use are included.

Twist Drills.—Detroit Twist Drill Company, 634 Fort Street West, Detroit, Mich. Pamphlet. Contains a concise description of a new twist drill that was illustrated in THE IRON AGE, April 22, 1915, and a number of miscellaneous tables and general information of value to users of drills. The advantage of the increased angle of twist found in this drill is touched upon at some length and a number of results that have been obtained in regular operation are included.

Concrete Mixers and Block Machines.—Miles Mfg. Company, Jackson, Mich. Two pamphlets. Describe the construction and operation of a concrete mixing machine and two types of machines for producing blocks of various sizes and styles. Illustrations of the different machines are presented together with engravings showing the several classes of blocks and buildings that have been constructed from them.

Pumps.—W. & B. Douglas, Middletown, Conn. Catalog M. Size, 6 x 9 in.; pages, 196. Presents illustrations with brief descriptions and specifications of a line of hand, spray and power pumps. Mention is also made of the various accessories, such as hydrants, fittings, foot and check valves, etc., as well as pneumatic tank outfits for supplying water for factories, etc. The various types of drive that can be used with power pumps are illustrated and directions for installing and operating the pumps as well as a number of tables of useful information are included.

Armored Rope.—Waterbury Company, 80 South Street, New York City. Catalog. Deals with an armored wire rope for long hard service. The rope consists of a hemp center, surrounded by a number of strands of wire rope, each of which is wound with a flat steel wire having convex edges. This forms a protective armor which relieves the tensile strength wires of abrasive wear and retains the strength of the rope unimpaired until after the flat wires have been worn completely through. Tables of the various sizes of armored rope that can be supplied are presented and a number of views of the rope in use on dredges, for handling sand, and in river and harbor, steam shovel, excavating and hoisting work are presented. Mention is made of some of the other products of the company, such as cordage, standard and fiberclad wire rope, music wire and binder twine.

Motors.—Davis Mfg. Company, Milwaukee, Wis. Bulletin No. 10 and circulars. Describe a horizontal opposed type of two to eight cylinder, 6 to 60 hp., stationary, portable and marine motors operating on gasoline, distillate or kerosene. These motors are intended for industrial use and are especially designed for operating small lighting plants for factories.

Metal Sawing and Grinding Machines.—Vandyck Churchill Company, 91 Liberty Street, New York City. Loose-leaf catalog. Illustrates and describes the Higley Machine Company's line of cold metal sawing machines with motor and belt drive. These machines are equipped with a sprocket wheel drive and the Higley automatic friction feed. An illustration shows eleven of the No. 10 machines mounted on one base and driven from a single lineshaft for simultaneous cutting on a bar, the feeding mechanism of each machine being independent of the others. The Higley portable and stationary motor and belt driven grinding machines are also shown.

Induction Motor Starters.—Allen-Bradley Company, 495 Clinton Street, Milwaukee, Wis. Bulletin No. B-54. Supersedes an earlier issue of the same bulletin and pertains to a resistance starting switch for alternating current squirrel cage and slip ring motors ranging from 1 to 100 hp. in size. The features of this starter which makes use of carbon compression resistances are touched upon, followed by a general description of the starter which is supplemented by illustrations, brief descriptions and dimension and wiring diagrams of the various forms in which it is made.

Motor Trucks.—H. E. Wilcox Motor Company, Minneapolis, Minn. Catalog. Describes and gives specifications of five models of motor trucks of ½ to 3 tons capacity for either light delivery or heavy factory purposes. The several uses to which this line of trucks can be put are illustrated by pictures of these machines in actual operation. Testimonials from firms using the trucks are included.

Steel Split Pulleys.—Keystone Pulley Company, Oneida, N. Y. Catalog. Describes and illustrates single and double pulleys with four to sixteen arms. The rims are made of 3/16 or ¼ in. steel, according to the diameter, which ranges from 6 to 60 in. By a system of bushings this pulley can be used on many different sizes of shafting by merely changing the bushing.

Automobile Cylinder Grinding Machine.—Boxill & Bruel, 112 East Fourth Street, Cincinnati, Ohio. Circular. Discusses a portable machine intended for the use of automobile repair shops where a large sized machine is prohibitive because of cost. An illustrated description of the machine, which operates by an electric motor, appeared in THE IRON AGE, February 18, 1915.

Refrigerating Plants.—Portsmouth Engine Company, Portsmouth, Ohio. Two circulars, three postcards and a collection of testimonials. Discuss small refrigerating plants of from 3 to 10 tons capacity for factories and small communities. The machinery employed, particularly the New Era gas engine, is described and illustrated and the economy of this plant emphasized.

Steel and Specialties.—Ellsworth Haring, 114 Liberty Street, New York City. Folder. Relates to various kinds of steel and specialties for different purposes. The steels listed include tool, nickel, drill, magnet, cold-rolled strip, automobile and high-speed steel, hack saw and nickel sheets, forgings of various kinds, wire, etc. Under each of the several headings, a brief statement is given of the uses to which it can be put or the particular grades that can be supplied.

Metal Working Machinery.—Mummert-Dixon Company, Hanover, Pa. Collection of pamphlets and circulars. Cover a line of metal working machines that includes die bolt cutting and oilstone and portable radial swinging grinding machines, an automatic facing tool and a nut die. Illustrations and brief descriptions of several machines are presented and in some cases specification tables are given. Illustrated descriptions of the portable radial swinging grinding machine and the automatic facing tool appeared in THE IRON AGE, April 23, 1914, and January 7, 1915, respectively.

Synchronous Converters.—Allis-Chalmers Mfg. Company, Milwaukee, Wis. Bulletin No. 1092. Calls attention to a line of synchronous or rotary converters for use where

alternating current has to be changed to direct. The construction of these machines, which are built in sizes ranging from 100 to 1000 kw., is gone into to some length. The text description is supplemented by engravings of the various parts and a number of illustrations of complete machines are included.

Centrifugal Pumps, Diesel Engines and Turbo and Gas Blowers.—Southwark Foundry & Machine Company, Philadelphia, Pa. Collection of bulletins. Refer to a line of centrifugal pumps of the single-stage, multi-impeller type and the multi-stage pump, a valveless engine operating on a Diesel principle and blowers for handling air and gas. In all of the circulars the various machines are described at length and in a number of cases the description is supplemented by views of the different parts and instructions on the installation and operation.

Electrogalvanizing.—Meaker Company, 1243 Fulton Street, Chicago, Ill. Pamphlet. Points out the advantages of using the electrogalvanizing process for coating articles with zinc in view of the fact that the price of zinc has rapidly advanced on account of war conditions. A list of pieces that have been galvanized by this process is given and includes articles ranging all the way from steel oil barrels and gate frames and posts to rods, wire screen cloth and chains. Comparative data on the cost of galvanizing by the hot and electric processes is included.

Drilling Machines.—Wm. E. Gang Company, Cincinnati, Ohio. Collection of loose leaf circulars. Illustrations and descriptive matter explain the construction and operation of a line of sensitive and radial drilling machines of the floor and wall types. A separate circular is given to each of the machines with an illustration and condensed specification table on one side and a description on the other which is supplemented by one or more line drawings of special features. Mention is also made of the plain and tilting box, round tilting on a pedestal and full universal tables, the last having a chuck attachment, which can be furnished.

Horizontal Return Tubular Boilers.—S. Freeman & Sons Mfg. Company, Racine, Wis. Bulletin No. 47. Illustrates and describes the construction of a line of horizontal tubular boilers, the engravings showing some of the machines employed. Following this specifications of the various sizes of boilers which are built for working pressures of 100, 125 and 150 lb. are presented with a number of views of the various boiler fronts, smoke connections, etc. Tables of measurements for the different types of settings are given.

Nitrogen Lamp Containers.—Metropolitan Engineering Company, Forty-second Street Building, New York City. Leaflet. Devoted to a method of converting arc lamps into containers for nitrogen lamps for street and industrial lighting. A drawing showing the reconstruction involved and the method of ventilation is included to supplement the text description.

Oil and Steam Separators.—Direct Separator Company, Syracuse, N. Y. Catalog. Discusses and illustrates the Sweet patent separator for removing water and oil from water, steam, exhaust steam, ammonia gas, illuminating gas and compressed air. The operation of this apparatus and the method of operation are taken up and a number of diagrams of the several types are included.

Can Making Machinery.—Charles Stecher Company, 108-128 North Jefferson Street, Chicago, Ill. Catalog. Illustrates and describes machinery for making tin cans and covers every phase of their manufacture. The list includes body making and wire bail forming machinery and assembling, handle riveting, double seaming, soldering and crimping machines. Special machines for particular types of product are taken up and a few types of the company's presses and bench drilling machines shown.

Gas and Gasoline Engines.—Chicago Pneumatic Tool Company, Fisher Building, Chicago, Ill. Bulletin No. 34-X. Takes up a line of gas and gasoline engines designated as class A-G to supplement class A-O of the company's Giant valveless, two-cycle low-grade fuel oil engines. They differ from this class only to the extent of the modifications necessitated by the employment of gas as fuel. This new class includes single and duplex types, developing from 16 to 130 hp.

Pulverizing Machinery.—Bradley Pulverizer Company, 92 State Street, Boston, Mass. Catalog No. 42 and four circulars. The first takes up the Bradley three-roll centrifugal roller mill for grinding hard and refractory substances. One of the circulars supplements this with a list of parts. The other circulars take up the 30, 36 and 40 in. types of Griffin mills. All of the circulars are illustrated.

Concrete Construction.—Trussed Concrete Steel Company, Youngstown, Ohio. Thirteenth edition of the Hy-rib book. Discusses a steel sheathing stiffened by rigid, deep ribs for use in the concrete floors, walls, partitions and sawtooth roofs of factory, foundry and machine shop buildings. A comprehensive list of illustrations includes views of this construction in all stages and gives an idea of the uses to which it can be put. A feature of this method is the elimination of forms in construction and the resulting fireproof structure.

Gasoline Engines.—Termaat & Monahan Company, Oshkosh, Wis. Catalog No. 21 and bulletins Nos. A-1 and 11. The first takes up a line of stationary and portable continuous service engines up to 20 hp. with special types for pumping and saw rigs. In this publication and in bulletin No. A-1, the several types are illustrated and the operation of the engines diagrammed as well as amplified by description. Bulletin No. 11 illustrates and describes one, two and three cylinder marine motors ranging up to 36 hp.

Engineering Construction.—Arthur G. McKee & Co., Cleveland, Ohio. Catalog No. 4. Size, 8½ x 12 in.; pages, 64. Illustrates and describes blast furnaces, hot blast stoves, skip bridges, blast furnace stock distributors, storage bins, power plants and material handling equipment designed and constructed by this company. The illustrations are entirely of actual installations. Cross-sections and pictures give much information concerning the Nelson patent hot blast stove and blast furnaces are also shown in cross-section. Special attention is accorded the McKee patent revolving stock distributor, this being described and depicted in detail. The Baker patent storage bin, including all-steel, concrete-steel and wood types, is the subject of special attention and in connection with this many types of material handling equipment are described and illustrated.

Bolt Cutting Machine.—National Machinery Company, Tiffin, Ohio. Folder. Calls attention to the continuous semi-automatic hammer bolt heading machine which was illustrated in THE IRON AGE, June 3, 1915. The special points of interest about the machine are briefly brought out on one of the inside pages while an engraving of the machine itself is presented on the facing one.

Metal Stampings.—Globe Machine & Stamping Company, Cleveland, Ohio. Booklet. Aims to convey by a few pictures and brief descriptions an idea of what the visitor would see on a trip through the shop. A separate page is given to each of the departments with an illustration at the top and the text matter below. Mention is made of the standard and special stampings that are produced as well as metal boxes, reels and beams for looms and tumbling barrels.

Motor-Operated Buckets.—Hayward Company, 50 Church Street, New York City. Catalog No. 42. Embodies a brief description of a motor operated clam shell bucket with numerous illustrations of it in use for handling all kinds of materials. Among the fields illustrated are foundries, industrial plants of various kinds, steel mills, boiler rooms, chemical and fertilizer plants and steam and electric railroads. The construction of the bucket is gone into at some length and a number of engravings are used to supplement the text description.

Exhaust Fan.—B. F. Sturtevant Company, Hyde Park, Boston, Mass. Mailing card. Shows a propeller type exhaust fan for pulley or motor drive. These fans are designed for installation either in windows or in walls to remove the used air and replace it with fresh, cool air. Among the fields for which these fans are designed are offices and factories for changing the air and foundries for removing smoke.

Stokers.—Combustion Engineering Corporation, New York City. Bulletin B-2. Gives general description and specifications for an underfeed type of stoker in which the coal is fed into the furnace from beneath the fire. The description of the stoker is quite complete and is supplemented by a number of engravings of the different parts. Instructions on installation, operation and banking are included together with a number of views of installations.

Turnbuckles.—Merrill Bros., Caspian Street and Long Island Railroad, Maspeth, N. Y. Collection of circulars. Several circulars embody brief descriptions of a line of turnbuckles, sleeve and clevis nuts and shackles with tables of the sizes of each that can be supplied. Two of the circulars call attention to a board lift and an air cushion hammer. In these the construction is gone into in some detail, the text being supplemented by engravings of the different parts. Mention is also made of a parallel swivel vise and a hoist wheel for use in raising loads up to 500 lb. in factories, mills, etc.

Wood Turning Lathes and Pumps.—Klotz Machine Company, Sandusky, Ohio. Collection of circulars. Pertain to a line of woodworking machinery of various types, such as an axe handle lathe, handle throating, end shaping, scroll, spoke and handle polishing and shaping saw machines and an electrically driven portable pump. Each of the circulars is devoted to a particular machine and illustrations, brief descriptions and condensed table of specifications being given on each.

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